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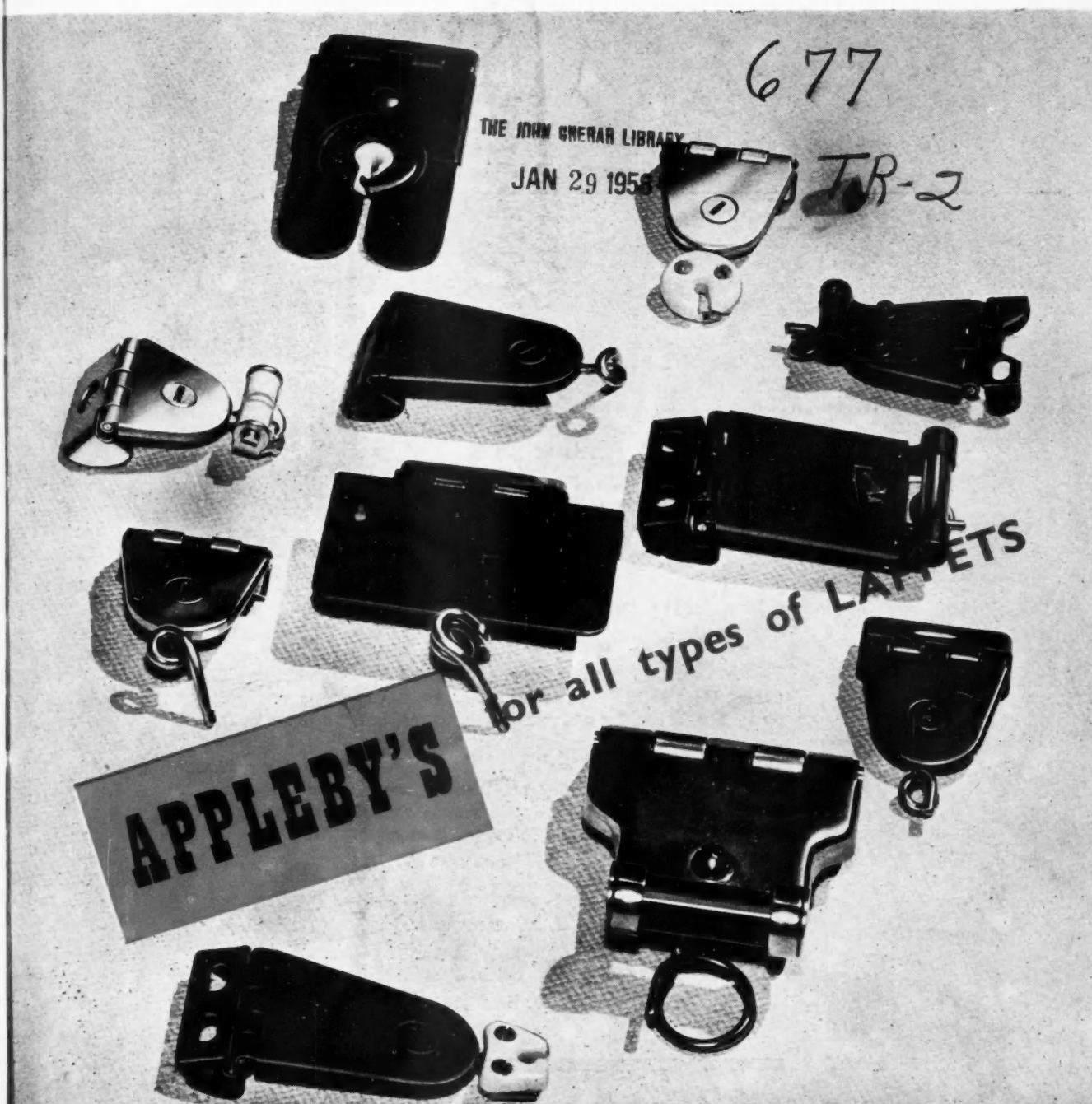

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PRODUCES FOR **JOHN CROSSLEY & SONS LTD.**

THROUGH THEIR ASSOCIATED COMPANY

MESSRS. SPUR DOUBLING CO. LTD.

Carpet Yarns
ON CONE OR CHEESE

The Westmorland Doubler is particularly suitable for processing Tufted Carpet Yarns being fed by multiple end wound packages normally 8″ × 8″ on 1½″ bore tubes, but a 10″ traverse × 8″ diameter package can be applied if desired.

This means a completely knotless package can be doffed in cone or cheese form, ready for the tufting machine. Maximum cone diameter 10″. Two turns for every revolution of the spindle are inserted, giving extremely high production, viz.: 3 fold/3s counts, inserting 3 T.P.I.

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Jack	—	CR 85
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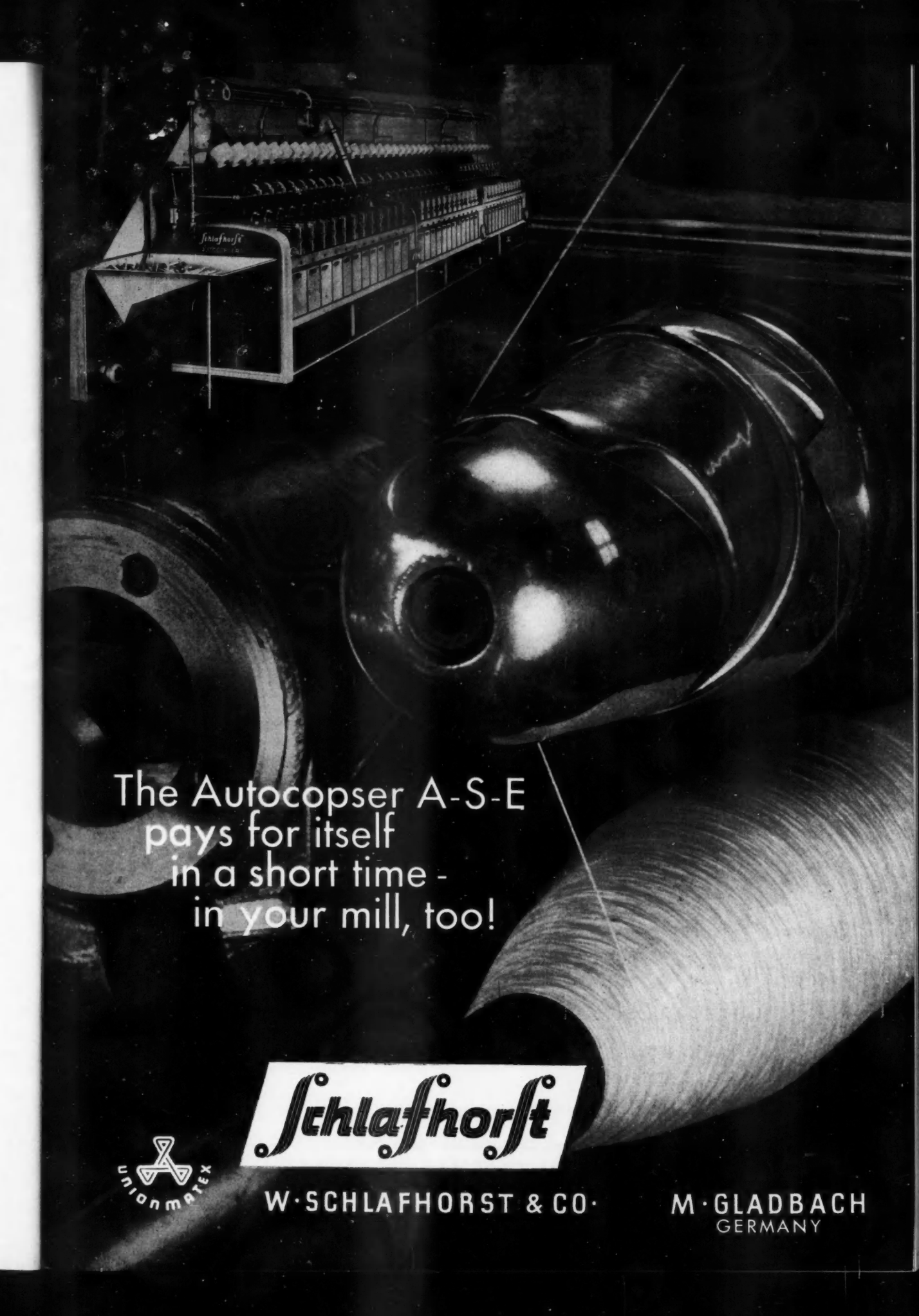
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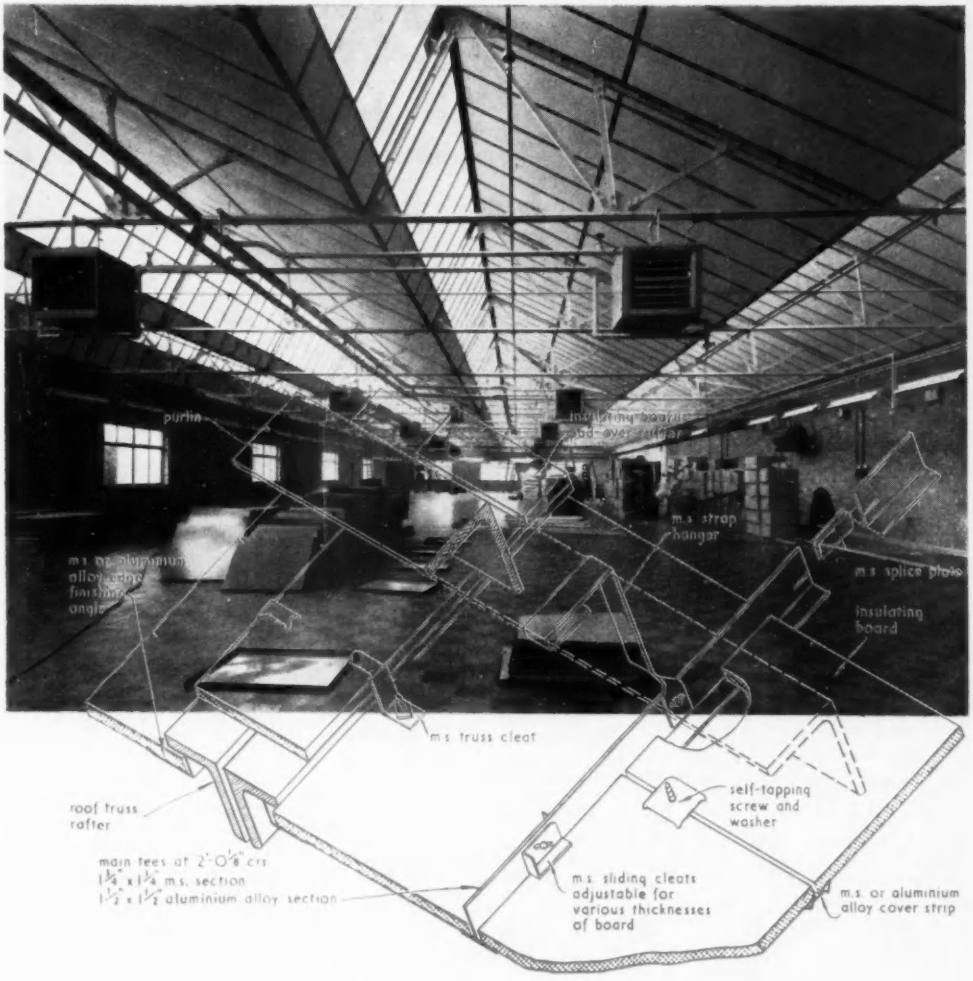
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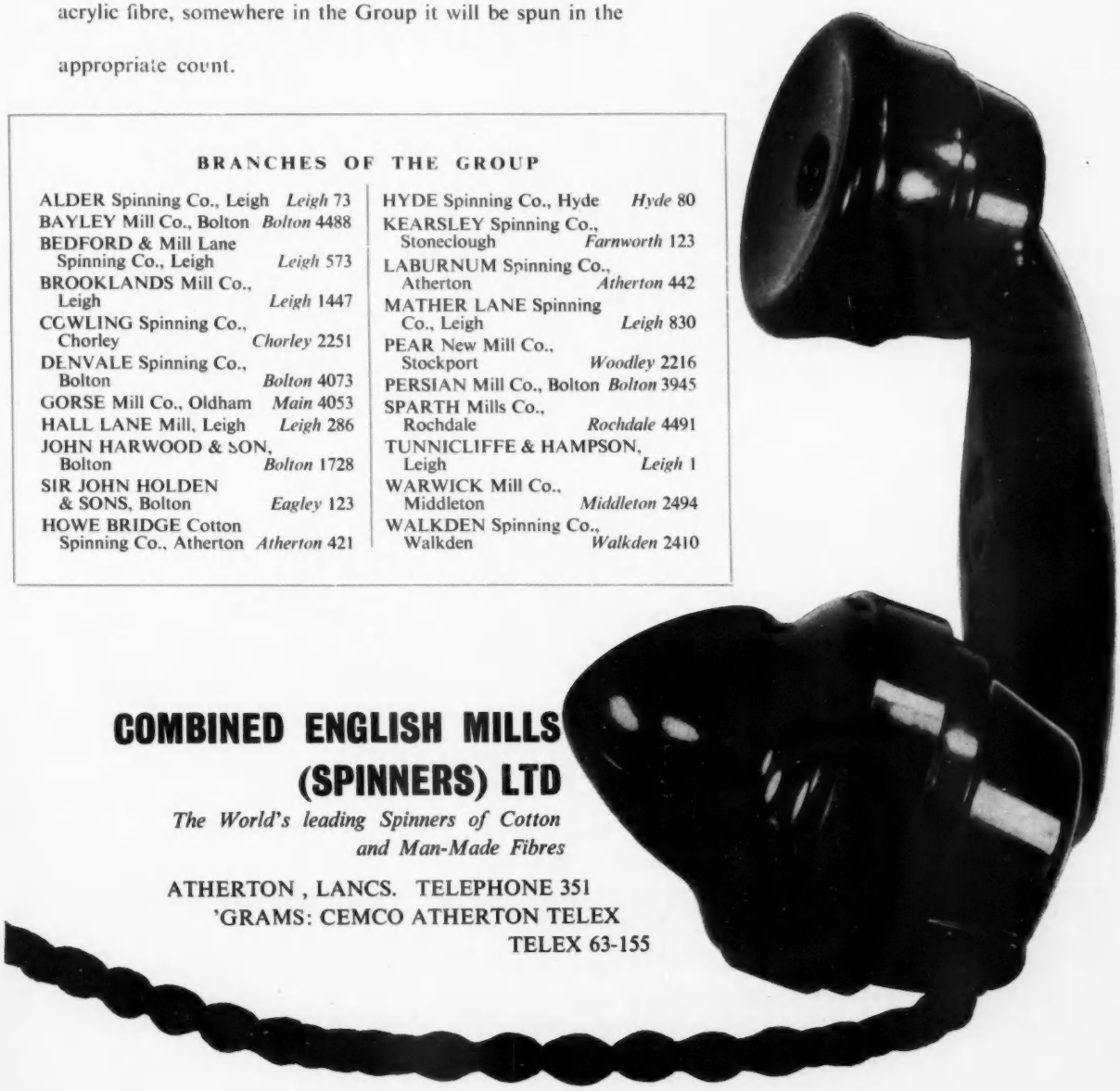

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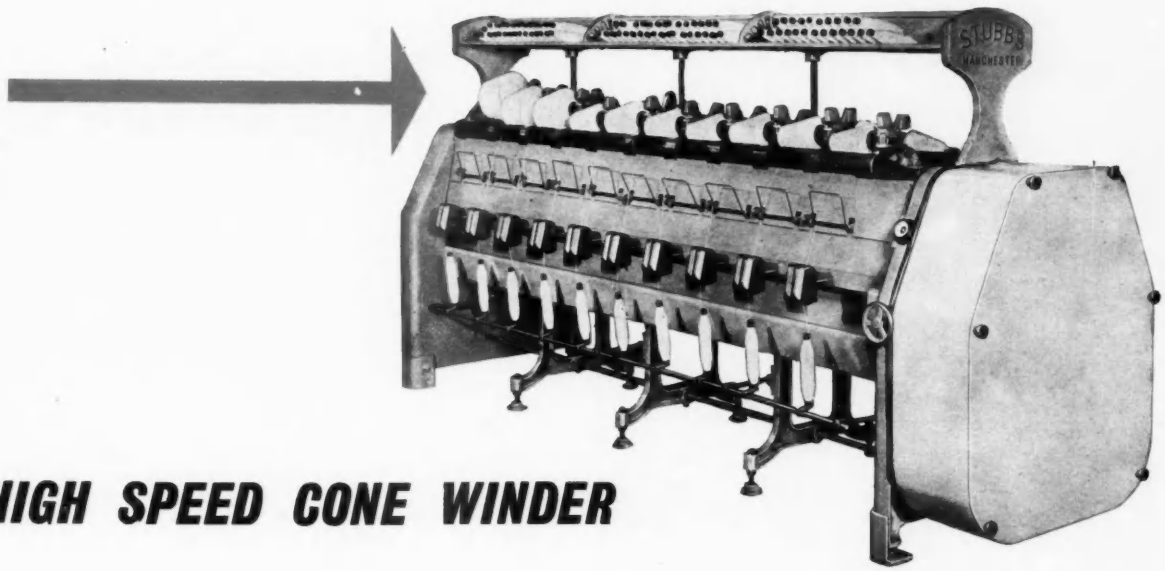

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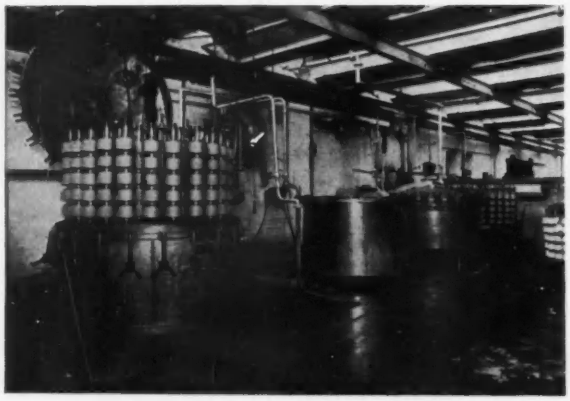

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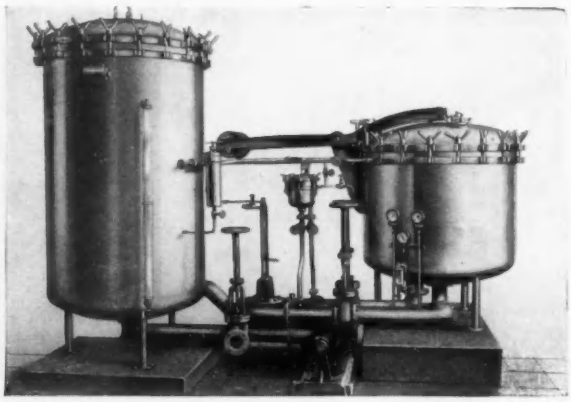

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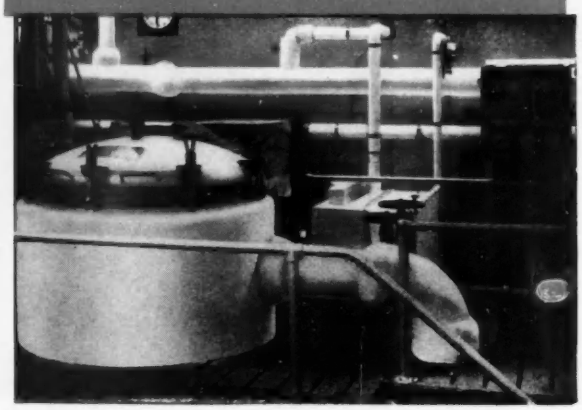

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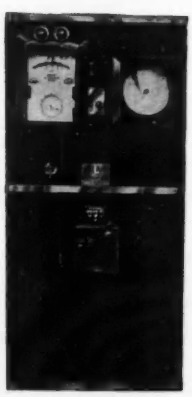

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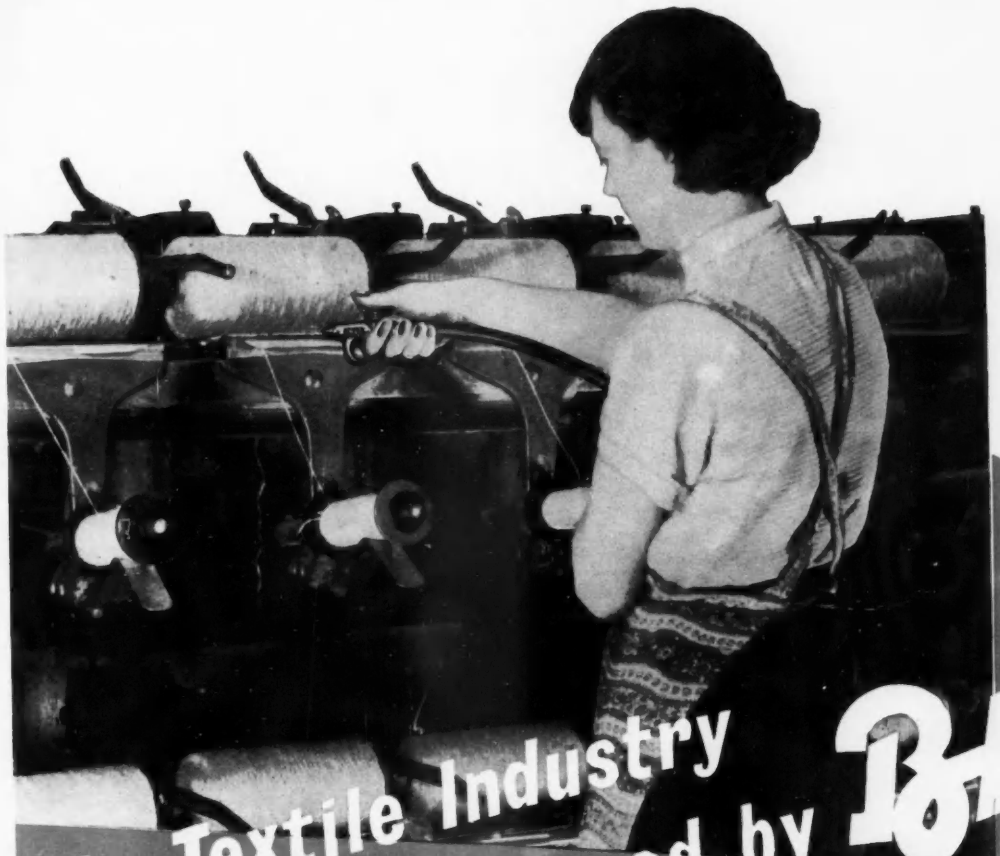

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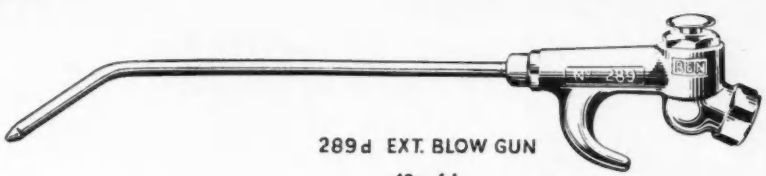

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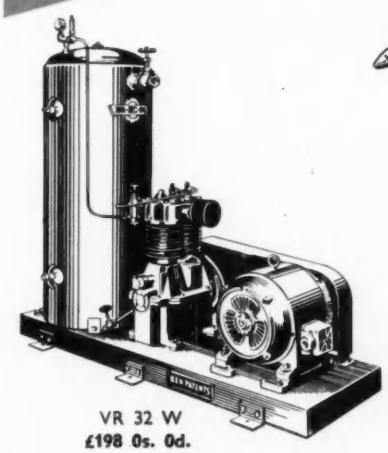

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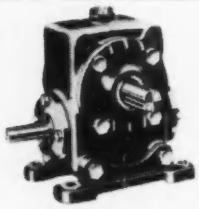
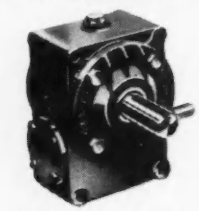
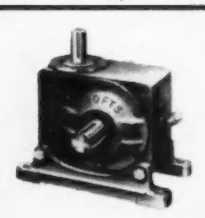
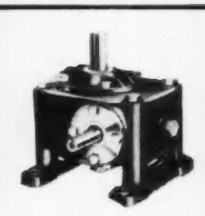
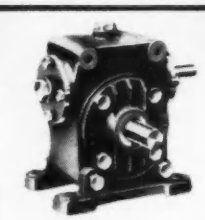

STANDARD TYPE


STANDARD TYPE (Without feet)


'D' MOUNTING TYPE


VERTICAL TYPE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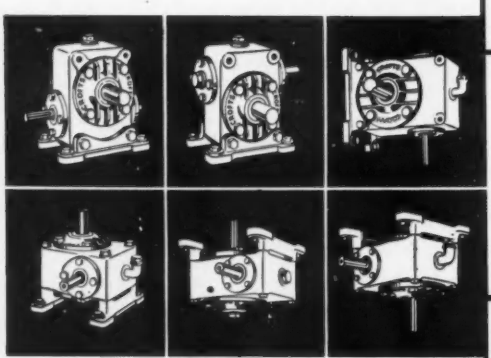

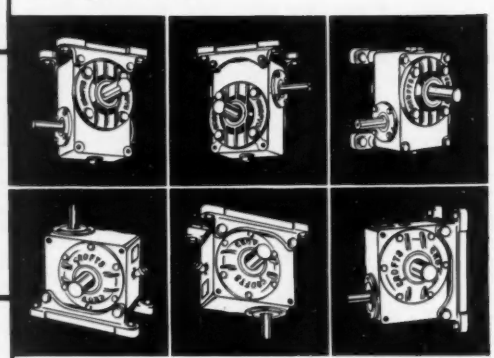

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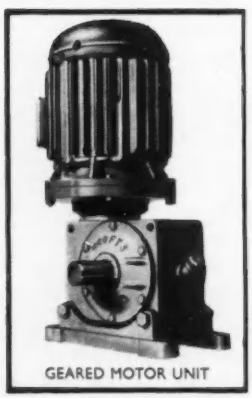
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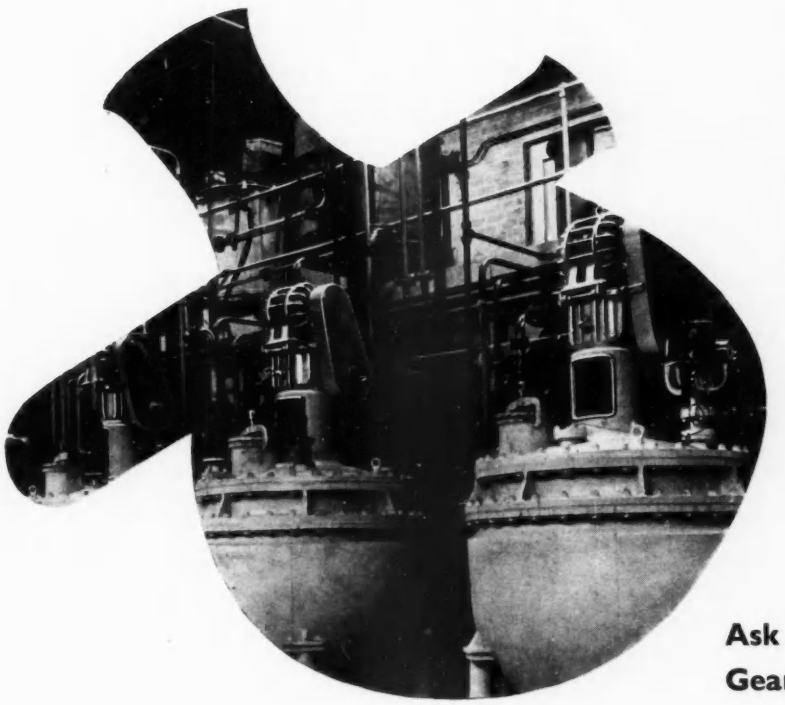

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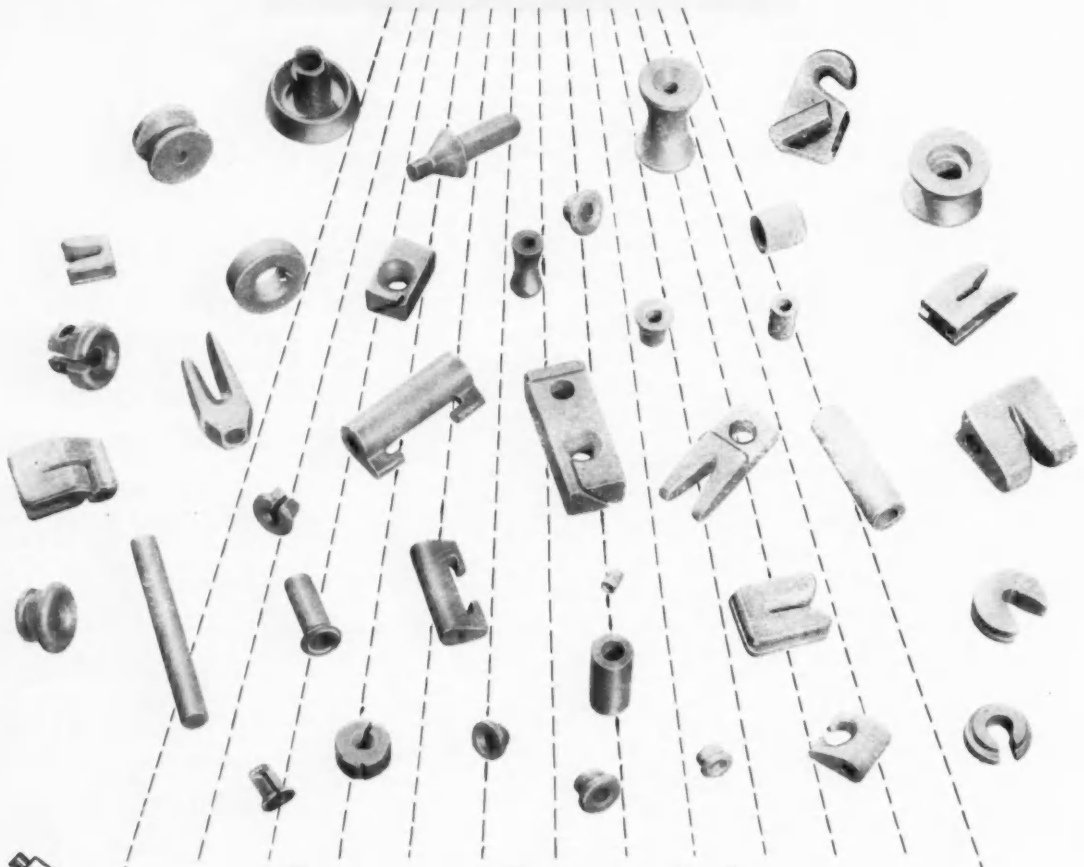

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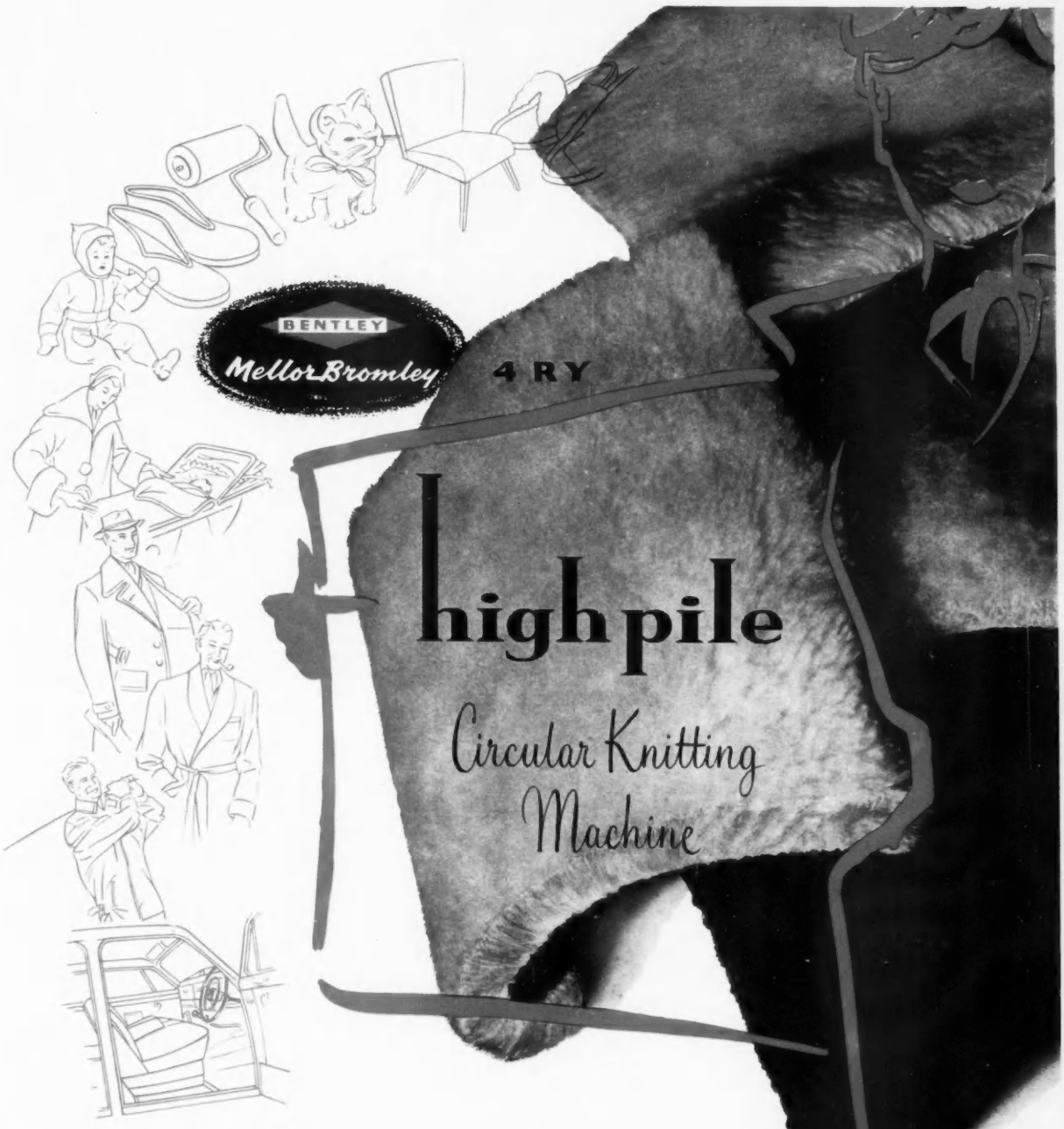
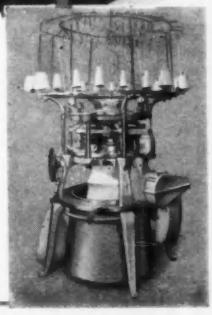
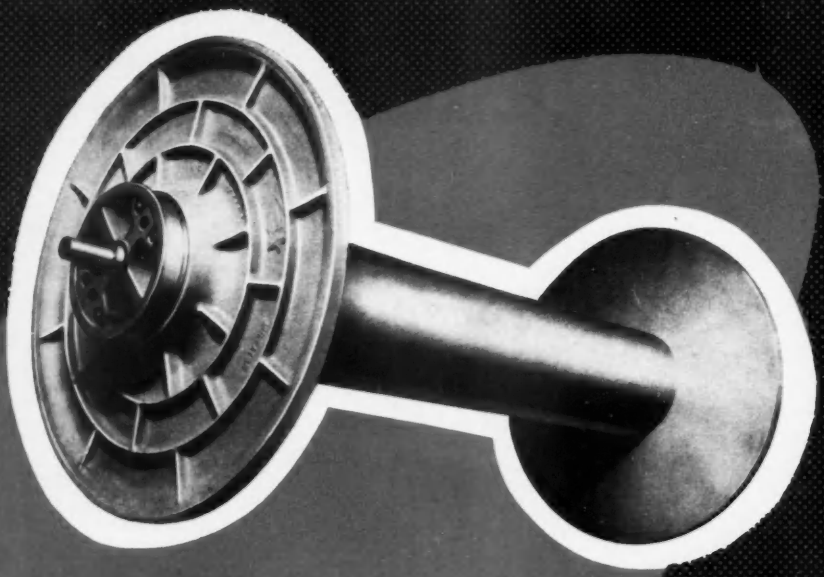


The new Mellor Bromley 4 R Y machine in 24" diameter and with eight knitting feeders, produces approximately 11 yards of high pile fabric per hour and requires only one operator for four machines. By the use of appropriate natural or man-made yarns or combinations of both, a wide range of fabric qualities and finished effects can be obtained, suitable for a wealth of applications.



MB 37

Built within the Bentley Group by :
MELLOR BROMLEY & CO. LTD., ST. SAVIOURS ROAD, LEICESTER *Telephone* : 38161 *Telegrams* : AUTOMATIC, LEICESTER TELEX,



LIGHTER ALL METAL HIGH SPEED BEAMS

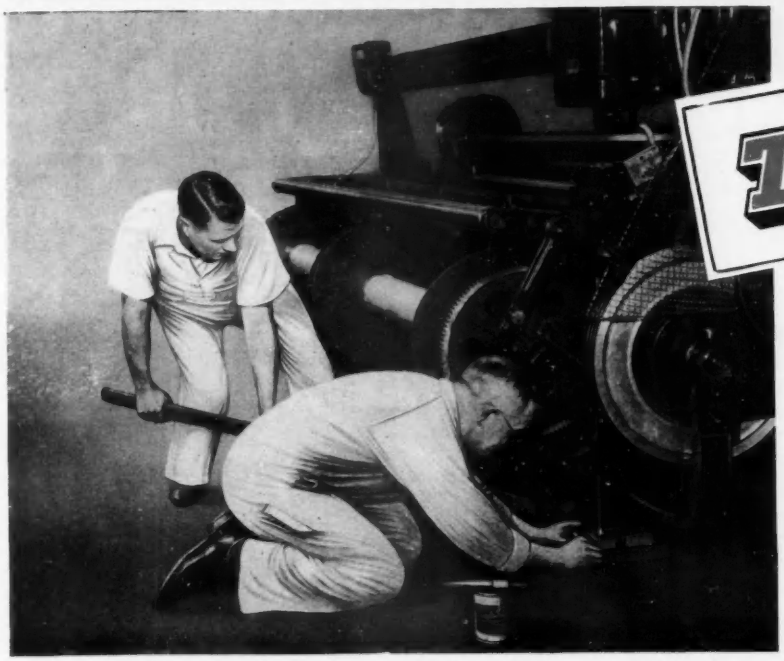
Dynamically balanced for smooth efficient running

Produced in 'Elektron' Magnesium Alloy which is 40% lighter than Aluminium, with equal strength properties. Other products include dynamically balanced Backing Drums, Adjustable Flanged Beams, Section Warp Beams, Loose Flanges, Jacquard Cylinders and larger type Bobbins, made to our exclusive design or customer's specific requirements. The services of our Textile Technical Department are at your disposal for information and advice in connection with the above, or any new projects.

STERLING METALS LTD.

COVENTRY AND NUNEATON

ARE YOUR TROUBLES MOUNTING?



LET

TICO

PADS SOLVE THEM FOR YOU

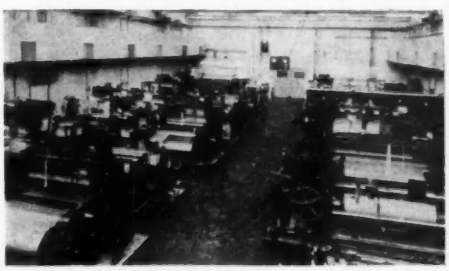
NO BOLTS REQUIRED

EASY TO MOVE

IDEAL FOR UNEVEN SURFACES

Suitable for any type of floor

Your only regret will be that you have not used them before !



Shown above : Ultra-modern weaving shed where TICO Anti-vibration Pads are installed under every loom. (Photograph by courtesy of the British Rayon Research Association).

Close up 3-yard Loom mounted on block type TICO PADS.

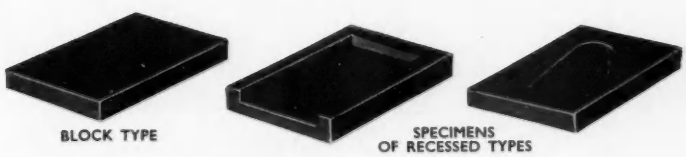
NO FUSS! NO BOTHER! NO BOLTS!

INSTALL TICO ANTI-VIBRATION PADS

FOR THE COTTON, WOOL, JUTE AND ALLIED SYNTHETIC FIBRE INDUSTRIES

TICO Anti-vibration Pads are obtainable in two standard types—BLOCK, and RECESSED, as illustrated. The BLOCK type is for normal installations, where machines are heavy and working speeds medium and low. The RECESSED types are for lighter-weight machines where higher-frequency vibrations occur.

- **TICO Pads reduce noise, disperse ground thump and thus reduce fatigue to both operator and machine.**
- **Considerable time and labour is saved when weaving sheds are being re-spaced.**
- **Simple and efficient in installation ; eliminate the need for holding-down bolts.**
- **On Ring Frame applications they counteract roller vibration and eliminate frequent re-setting.**



BLOCK TYPE

SPECIMENS OF RECESSED TYPES

COTTON INDUSTRY ENQUIRIES TO SOLE MANUFACTURERS TO :—

TEXTILE INDUSTRIAL COMPONENTS LTD.
Head Office : Warsall Road, Wythenshawe, Manchester 22
Phone : WYThenshawe 3458/9 Manchester Royal Exchange Pillar, G13

WOOLLEN AND WORSTED ENQUIRIES TO:—

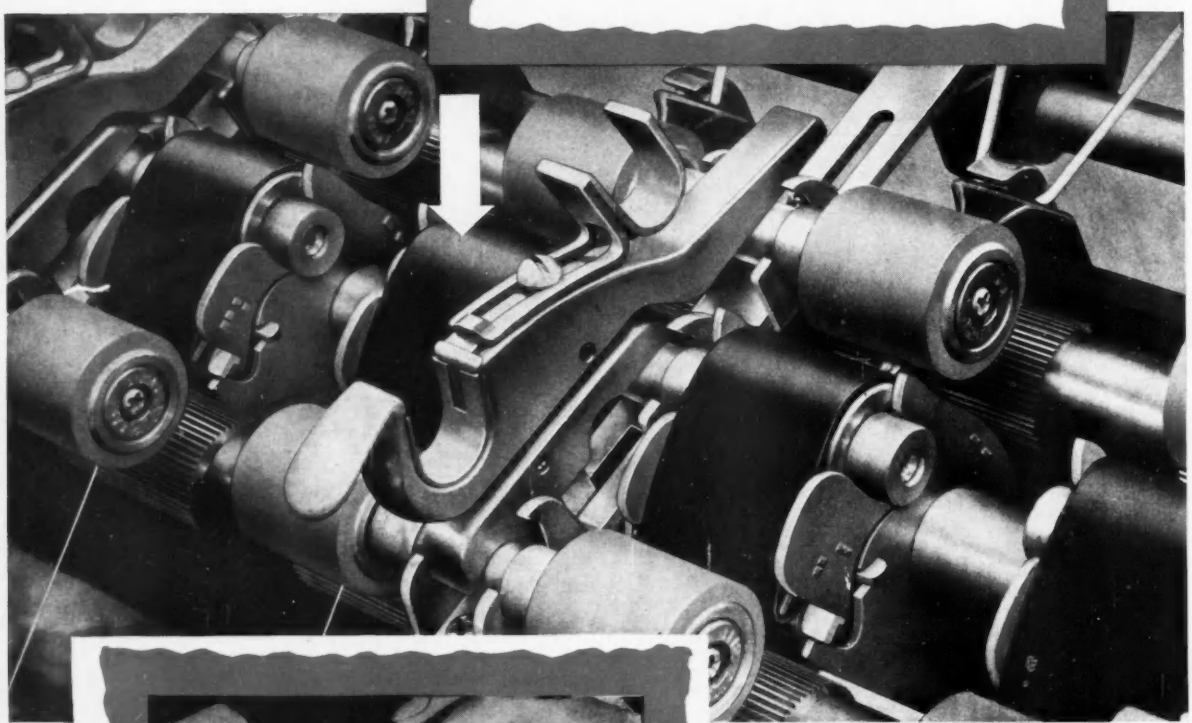
TEXTILE INDUSTRIAL COMPONENTS LTD.
Tico Works, 21 Union Road, Low Moor, Bradford. Phone : Low Moor 565

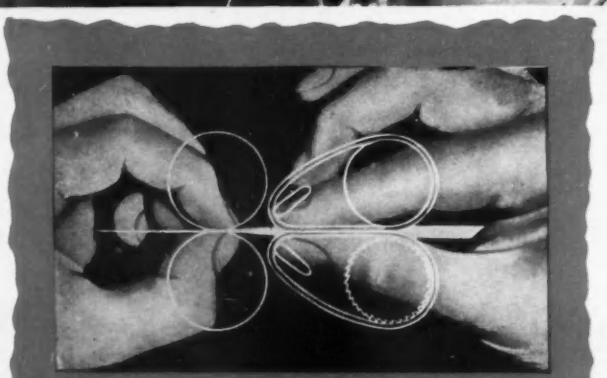
JUTE AND ALLIED INDUSTRY ENQUIRIES TO :—

HUGH G. FYFE
10 Panmure Street, Dundee. Phone : DUNdee 2892

use

Casavon Bands





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Telephone : DEAnsgate 2335

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STAINLESS STEEL

Bolts, Nuts,
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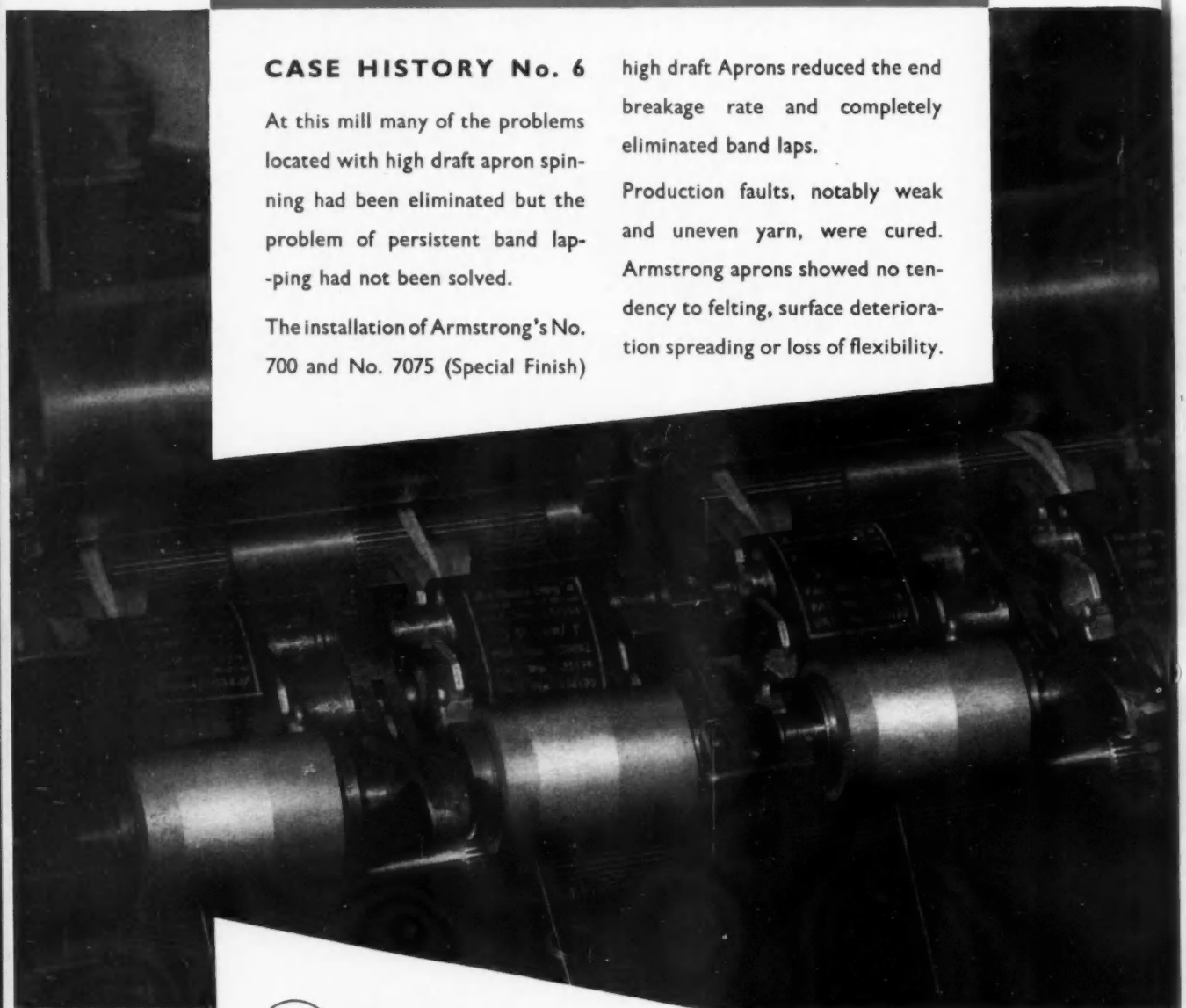
Codes ABC 5th edition Marconi International

MILL MODERNIZATION



CASE HISTORY No. 6

At this mill many of the problems located with high draft apron spinning had been eliminated but the problem of persistent band lapping had not been solved.

The installation of Armstrong's No. 700 and No. 7075 (Special Finish) high draft Aprons reduced the end breakage rate and completely eliminated band laps.

Production faults, notably weak and uneven yarn, were cured. Armstrong aprons showed no tendency to felting, surface deterioration spreading or loss of flexibility.

Armstrong

ACCOTEX* cots & aprons

Armstrong Accotex Cots and Aprons give improved drafting for greater yarn regularity and increased wear resistance to withstand synthetic fibres. They possess electrolytic properties which decrease roller laps and by their longer life reduce costs.

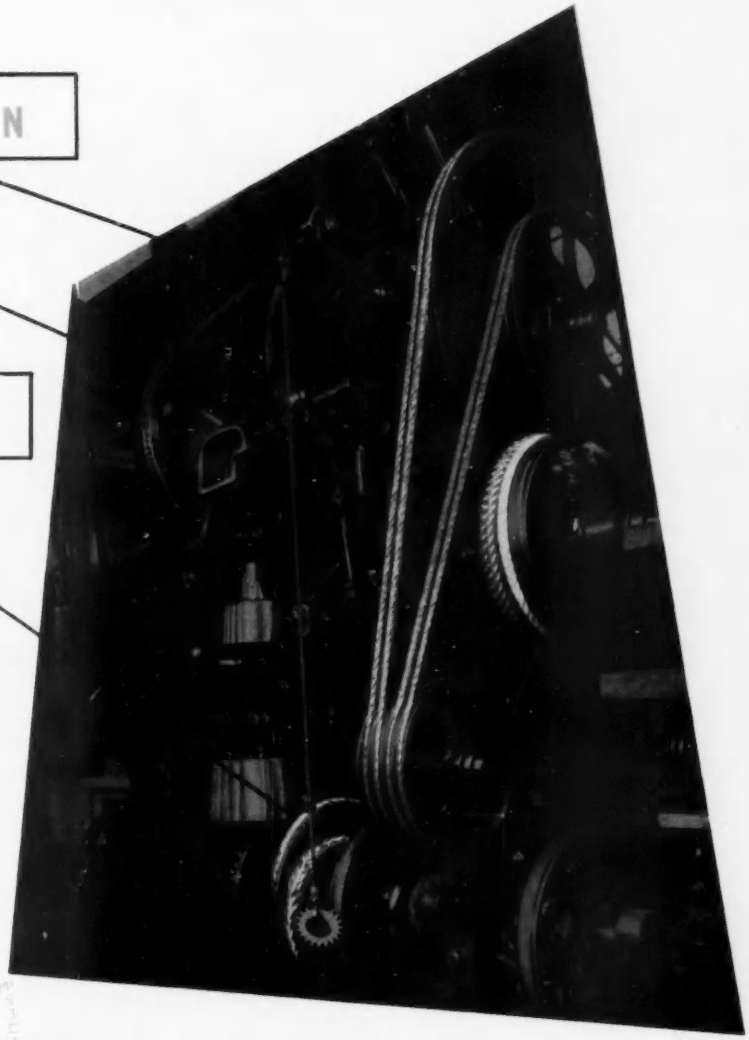
ARMSTRONG CORK COMPANY LTD., 210-213 ROYAL EXCHANGE, MANCHESTER 2. Telephone : DEAnsgate 7311/2 and 8078. And at 24 Humboldt Street, Bradford, and 5 Oswald Street, Glasgow, C.1. Regd. Office: Kingsbury, London, N.W.9. Factories: OLDHAM and GATESHEAD-ON-TYNE.

* *Registered Trademark Armstrong Cork Company Ltd.—Registered User.*

NYLON

COTTON

COTTON/NYLON



Textile Ropes in Cotton Nylon or Terylene

With the introduction of synthetic fibres, such as Nylon and Terylene, textile ropes can now be made which have a much longer working life than hitherto.

Ropes which have to take more strain than others, such as rim and draw bands, can be strengthened with Nylon or Terylene yarn, and so avoid the disruption caused by too frequent rope breaking.

The spinning mule shown above, photographed in a Yorkshire woollen mill, has a Cotton down band, rim and draw bands of Nylon, and scroll bands made of Cotton blended with Nylon.

Are you using the best type of rope on your textile machines? If in doubt, ask for our representative to call, or write for our technical advice, which will be given without obligation.

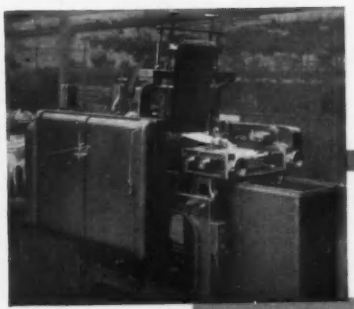
Kirkstall Brand Ropes by LEDRAY

SAMUEL LEDRAY AND SONS · ST. ANN'S MILLS · KIRKSTALL · LEEDS 5 · ENGLAND

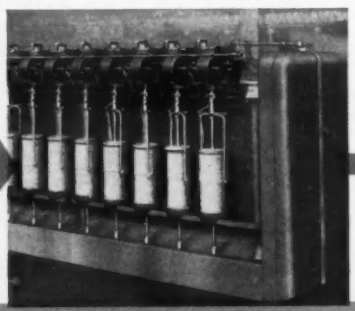
2677052

with the NEW BRADFORD

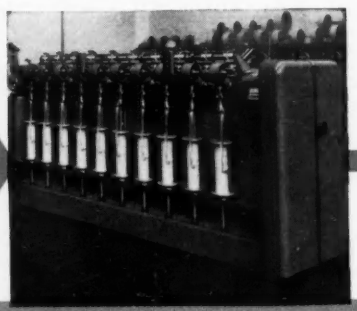
* *Incorporating the* RAPER AUTOLEVELLER



Autoleveller Gill KRG.1



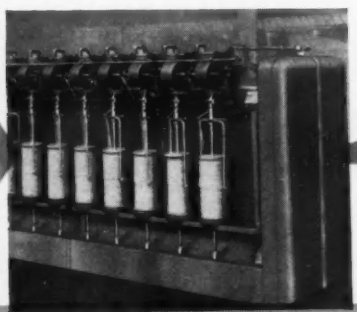
10-spindle Autoleveller Drawbox KRD.1



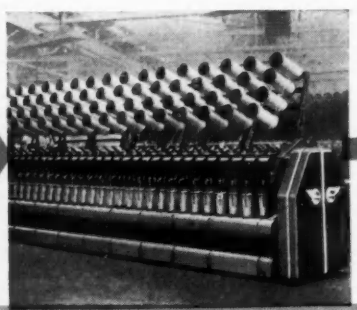
Drawing Finisher KOD.

With 20 Drawing Finisher KOD Spindles the Drawing Set above will feed 3,600 Megaflex/ASD KMF2 spinning spindles to produce 120 lbs per hour on 1/40's worsted counts.

Autoleveller Gill KRG.1



10-spindle Autoleveller Drawbox KRD.1



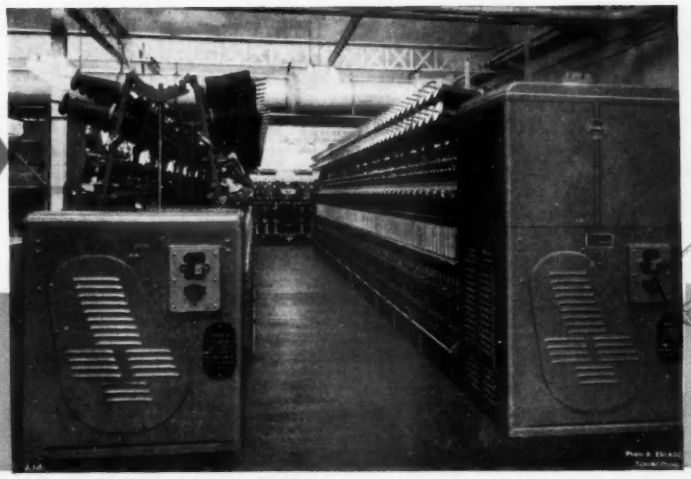
MS2 Cone Reducer

With 56 MS2 Cone Reducer Spindles the Drawing Set above will feed 1,800 Megaflex/Apron High Draft KMF1 spinning spindles to produce 120 lbs an hour on 1/24's worsted counts.

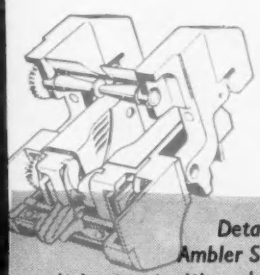
Sole licensees and manufacturers of the Raper Autoleveller.
Covered by world patents and patent applications.

***OVER 5,000 AUTOLEVELLER UNITS ARE INSTALLED IN 31 DIFFERENT COUNTRIES**

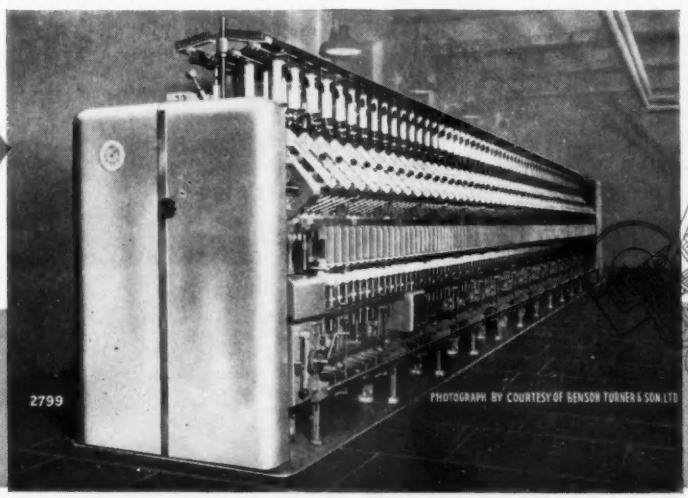
SYSTEM two drawing operatives produce 120 lbs per hour



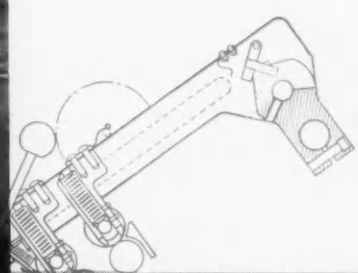
Megaflex/ASD Spinning Frame KMF.2



Detail view of Ambler Superdraft unit in open position, showing the flume, intake guide, and top and bottom tension rollers.



Megaflex/Apron High Draft Spinning Frame KMF.1



Sectional elevation of the Apron High Drafting system, showing the general arrangement of the rollers and the apron, and the method of locking the roller arm.

PRINCE-SMITH & STELLS LTD.

INCORPORATING TAYLOR WORDSWORTH & CO. LTD.

KEIGHLEY · YORKSHIRE · ENGLAND

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Introducing

TURNERS Premium V-BELT

with the NEW super strength member
transmitting an average of
40% more Horse Power

PLUS 5 ALL-IN-ONE ADVANTAGES

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* *Write for full information*

TURNER BROTHERS ASBESTOS CO. LTD. ROCHDALE ENGLAND

A MEMBER OF THE TURNER & NEWALL ORGANISATION

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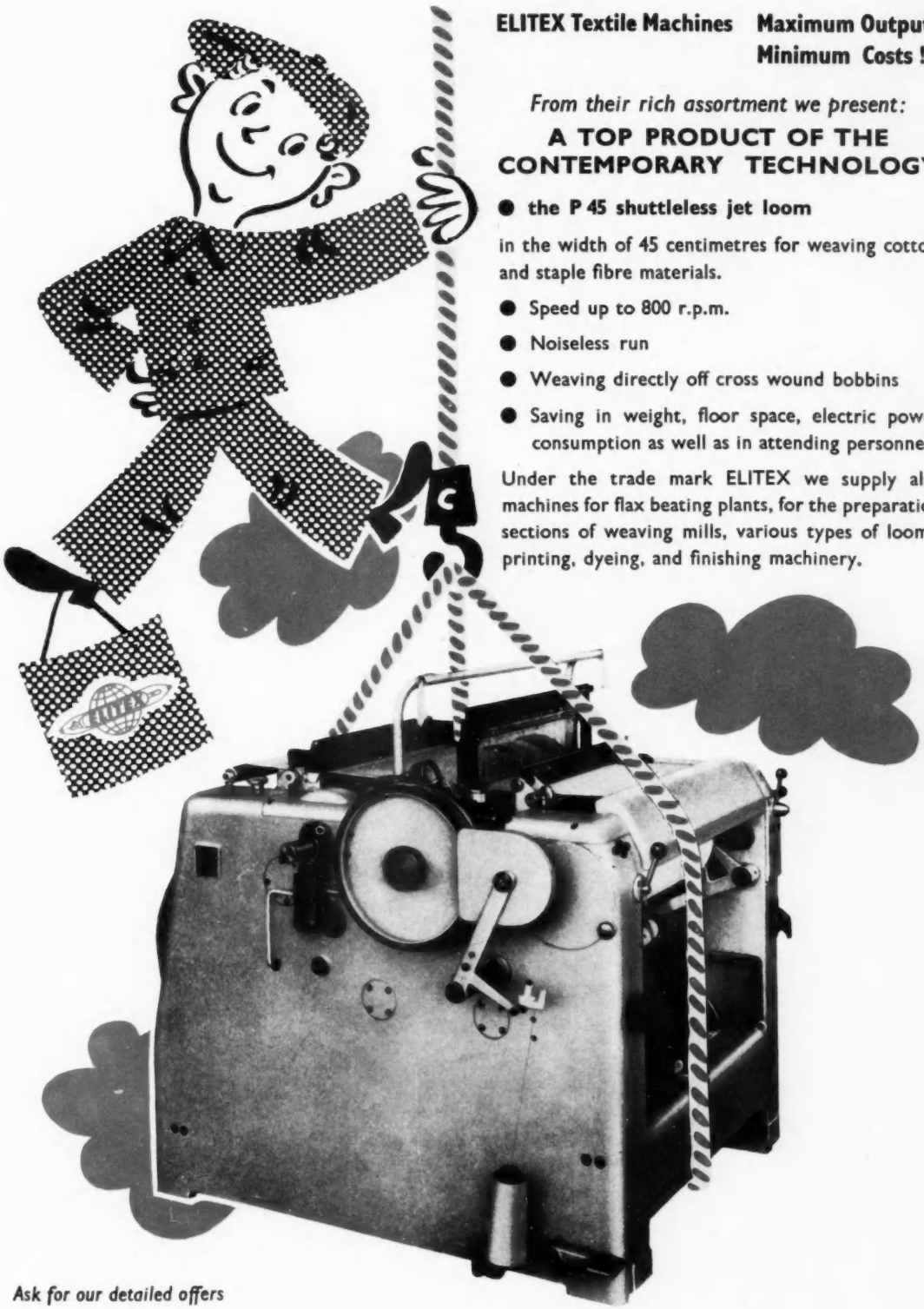

ELITEX Textile Machines **Maximum Output, Minimum Costs !**

From their rich assortment we present:

A TOP PRODUCT OF THE CONTEMPORARY TECHNOLOGY

- **the P 45 shuttleless jet loom**

in the width of 45 centimetres for weaving cotton and staple fibre materials.

- Speed up to 800 r.p.m.
- Noiseless run
- Weaving directly off cross wound bobbins
- Saving in weight, floor space, electric power consumption as well as in attending personnel.

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—the long-life band you cannot beat

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SILENTBLOC ENDLESS EXTENSIBLE SPINDLE BANDS

produce better yarn and more of it by eliminating spindle speed variation and giving a long trouble-free life at high speeds. They drive with just the right degree of tension and thus save not only power but wear on bolsters and spindle footsteps. Silentbloc bands are unaffected by oil or atmospheric changes. Available in running lengths of 30" and upwards. Diameter $\frac{1}{8}$". Endless elastic bands of $\frac{3}{16}$", $\frac{1}{4}$", $\frac{3}{8}$" and $\frac{1}{2}$" diameter can be provided for Fly Comb and other heavier drives where a band thicker than the standard $\frac{1}{8}$" diameter mule spindle band is required.

There's no mistaking Silentbloc bands. Their finish and red colour distinguish them as the best spindle bands on the market.

Can we send a representative to show you a sample?

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All the technical resource and "know how" of years of rubberising experience are in the Witco method — and great, *very great*, are the advantages possessed by fabrics backed the Witco way. That is why U.S. Fabric Manufacturers and furniture makers have for years been Witco enthusiasts.
Happily, the Witco method is now available to fabric manufacturers throughout Britain, and Witco-backed fabrics are already obtainable from firms using the Witco technique.

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10 OUTSTANDING ADVANTAGES

INCLUDING

- ★ IMPROVED APPEARANCE AT LOWER COST
- ★ Distinctiveness of pattern; dimensional stability
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- ★ Produces a very satisfactory pile bind
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- ★ Prevents fraying
- ★ Prevents fabric or seam slippage
- ★ Contributes to a satisfactory fabric handle
- ★ Permits decrease in the number of picks used, so saves fibre costs
- ★ Increases weaving production and efficiency

BETTER TRADE — MORE MONEY

The necessary rubberising plant is not expensive and the cost is quickly recovered by the quite revolutionary advantages, savings and increased orders effected. All technical help and advice regarding Witco Synthetic Backing Compound is offered FREE. So is the experimental use of the Witco Pilot Plant at Droitwich.
To fabric manufacturers we say — please communicate with us. Enquiries will be treated in confidence, and at the highest level.

To furniture makers we say — insist on Witco backed fabrics. *They're* the winners.

To both we say — Witco does a better, longer lasting and more acceptable job at lower cost. That way lies vastly better trade and more money. So Enquire NOW.

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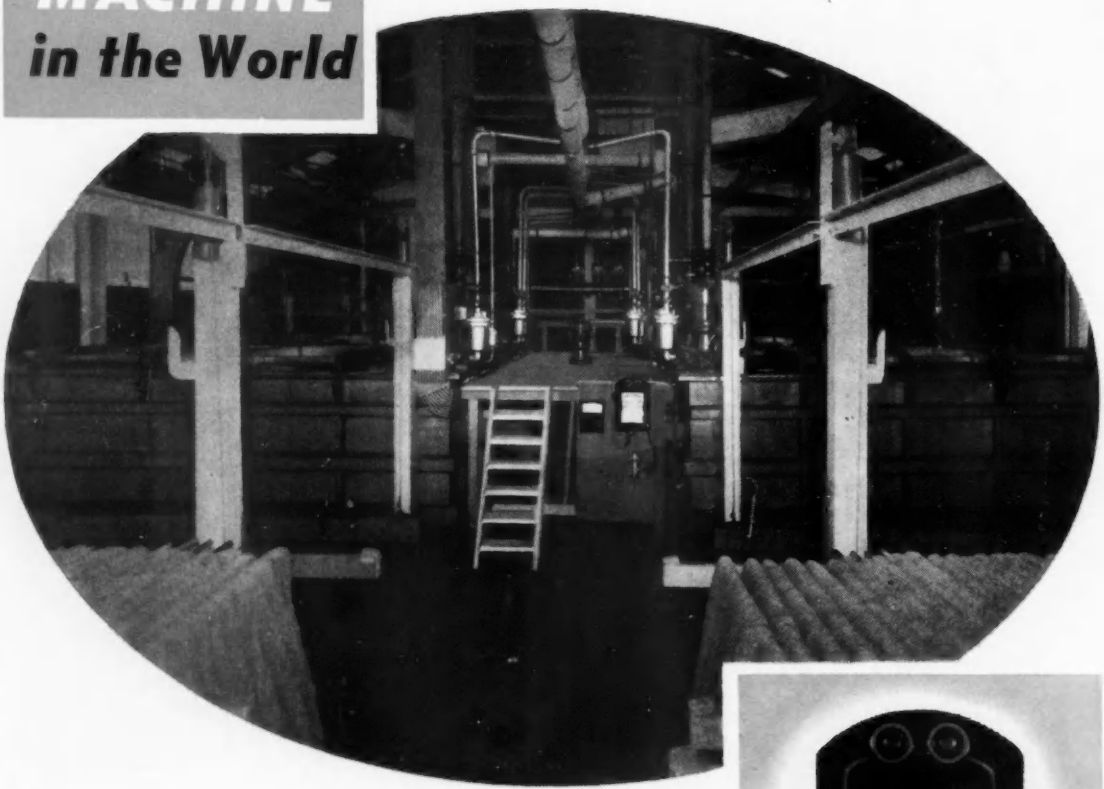
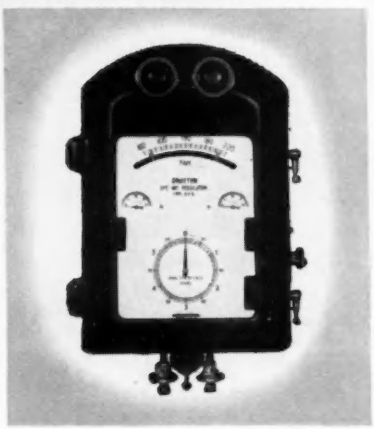
★ The largest DYE VAT MACHINE in the World

Longclose large hank dyeing machine now in operation at the Birstall Carpet Co. Ltd., for dyeing 9,000 lbs. of yarn at a time. 12,500 gallons of liquor are withdrawn, mixed and interchanged between four tanks and temperature control is a critical feature. Any slight difference in the rate of temperature rise between the tanks would cause lack of uniformity of shade. The machine is fully automatic: the temperature of the four vats is controlled by a Drayton D.V. 3 Dye Vat Control.



DRAYTON dye vat controls, for all types of dyeing machines, are completely automatic, absolutely dependable and do not call for skilled operators. They maintain a continuous degree of accuracy unobtainable by manual control. They reduce working costs and ensure improved and uniform production. For full information write for the booklet "The Application of Automatic Control to the Dyeing Process."



The Drayton D.V.3 Dye Vat Control.

★ Fully automatic and controlled by

DRAYTON

Dye Vat Control

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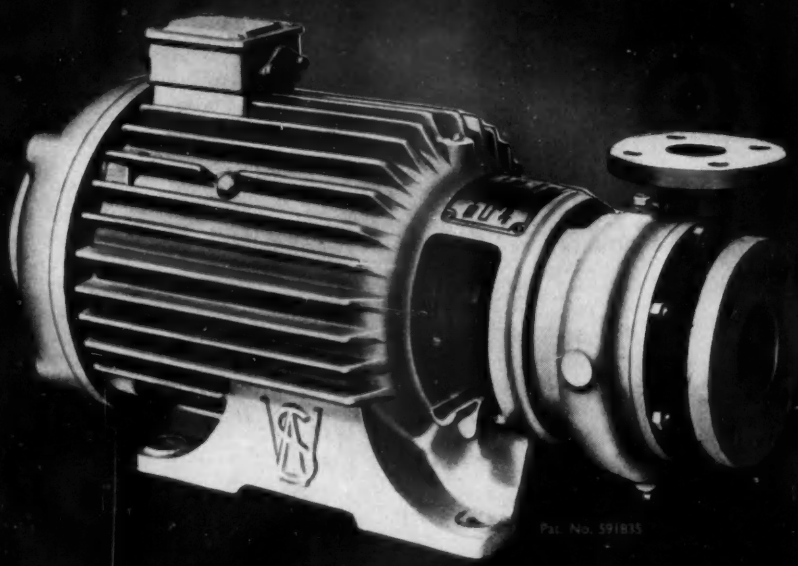
THE DRAYTON REGULATOR & INSTRUMENT CO. LTD., WEST DRAYTON, MIDDLESEX. *Tel.: West Drayton 4012*

NEW chemical resistance

Worthington-Simpson pumps in WORTHITE, superior alloy steel, offer full corrosion resistance to sulphuric and many other acids and alkalis. For pumping mildly corrosive liquids, 18/8/3 Stainless Steel is specially suitable and it will not contaminate or discolour non-corrosive liquids. This range of pumps is of cost-saving Monobloc construction, and the pumps themselves have interchangeable stuffing box glands and mechanical seals to permit simple changes to suit different processes.



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CHEMICAL PUMPS

in WORTHITE and 18/8/3 STAINLESS STEEL

Here are just a few of the many liquids which these pumps will handle effectively and safely

Sulphuric Acid
Acetic Acid, glacial
Acetic Anhydride
Acetone
Alcohols
Benzoic Acid
Boric Acid, cold
Butyric Acid
Calcium Bisulphite
Caustic Potash, 70° F
Caustic Soda up to 50%
Chlorosulphonic Acid, 120° F (pure)
Chloroform
Copper Sulphate
Ethyl Acetate, 70° F
Fatty Acids
Formaldehyde, 70° F
Glycerine
Magnesium Sulphate, 5%, 70° F
Nitric Acid, all concentrations
Oleum, up to 120° F
Phosphoric Acid, 10%, 70° F
Phosphoric Acid, 85%, 70° F
Refinery Crudes
Silver Nitrate, 70° F
Sodium Sulphate, 5%, 70° F
Sodium Sulphide, 5%, 70° F
Sodium Sulphite, 5%, 70° F
Sulphurous Acid

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write for WORTHITE & 18/8/3 1" Specimen Discs and test them under your own site conditions

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THE CLEAN AIR ACT and Fuel Efficiency

Hodgkinson offer two types of mechanical stokers for firing shell type and small water tube boilers.
They are both SMOKELESS.
Firstly, the "Low Ram" Stoker of which there are many thousands at work throughout the world; secondly, the Chain Grate Stoker. Both of these will burn efficiently low grade fuels of all N.C.B. rank numbers. These machines are individually designed for each application.

Stoker rental Scheme available

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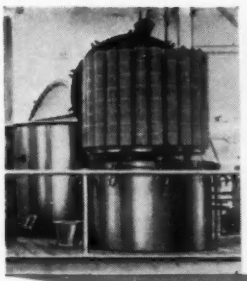
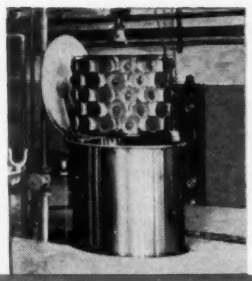
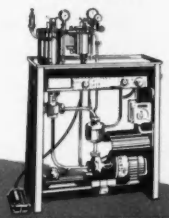
Packages



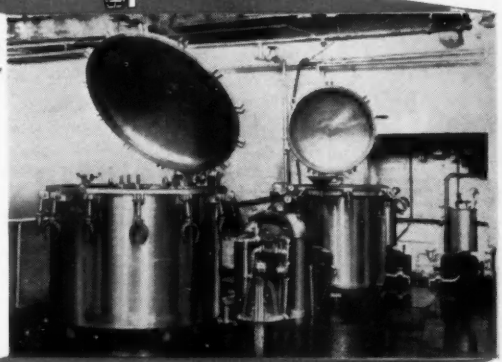


Laboratory
(PACKAGE)

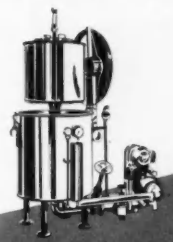


Drying

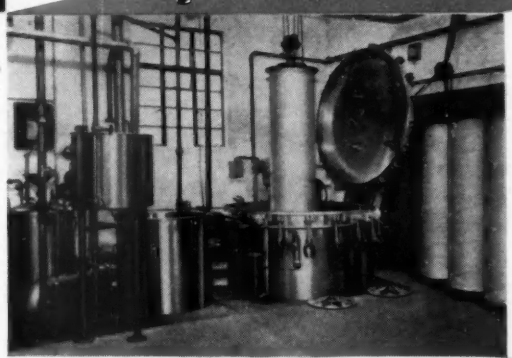
Tops



Pre and after Treatment

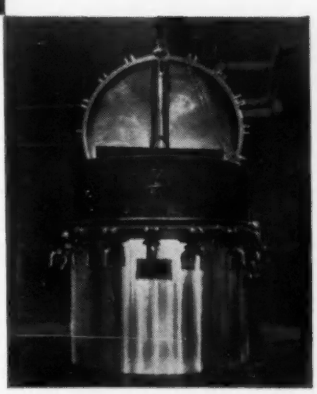


Beams



Laboratory
(SKEIN)

Loose Stock



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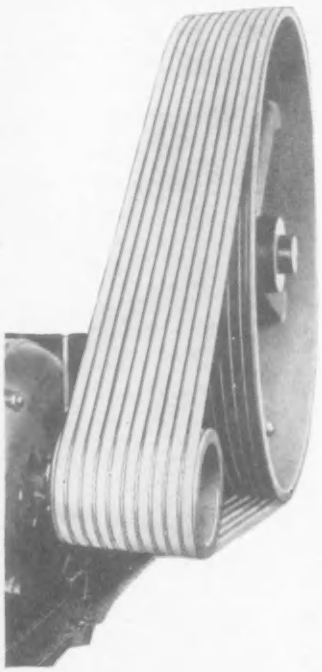

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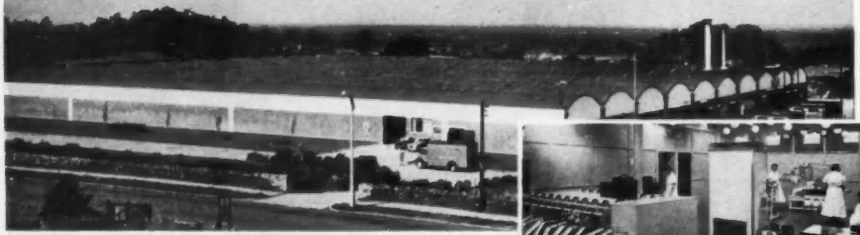

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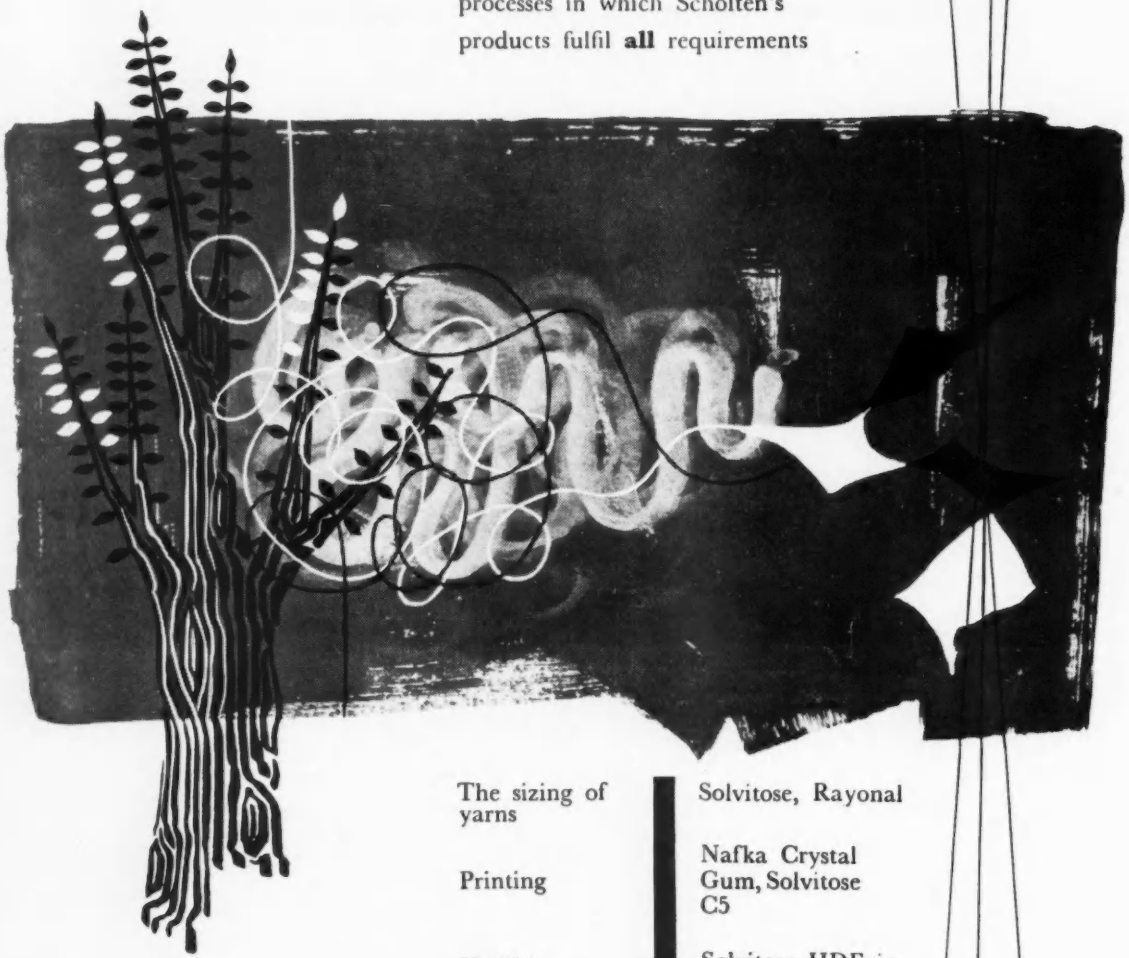

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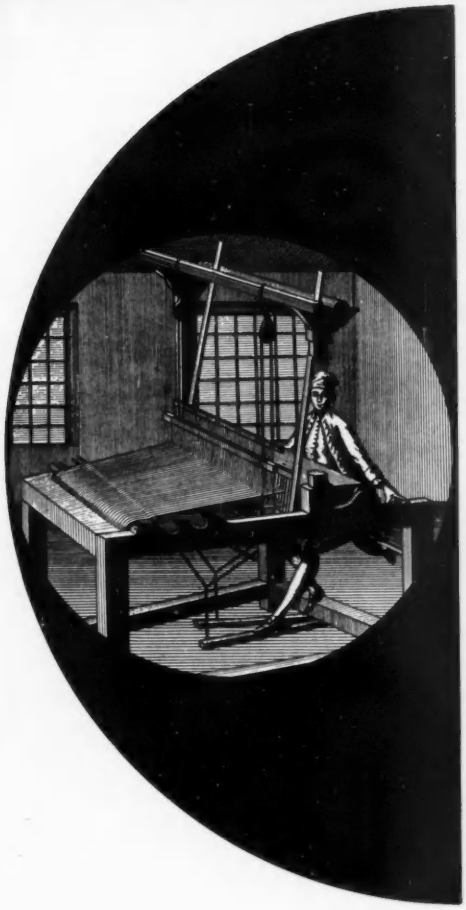

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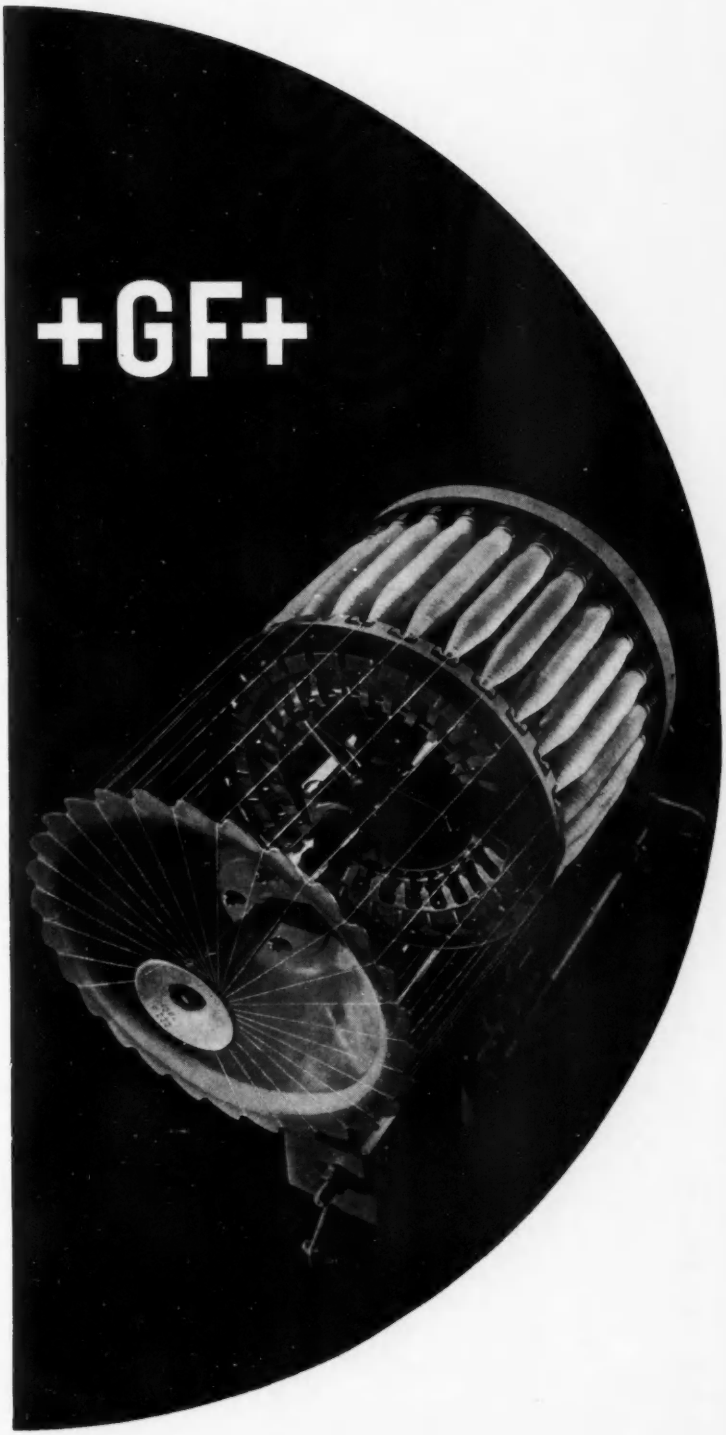

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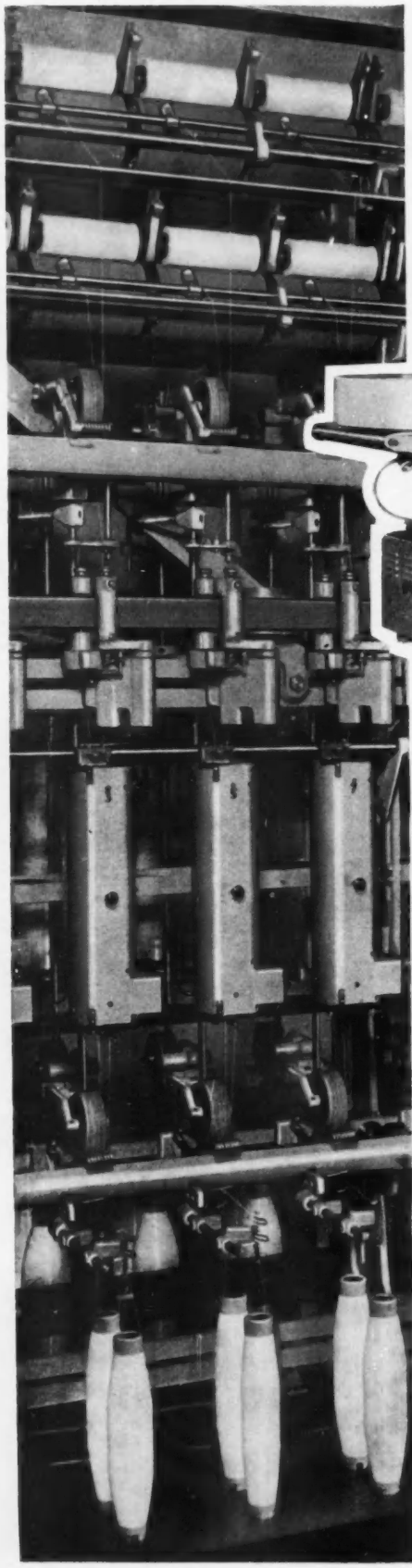

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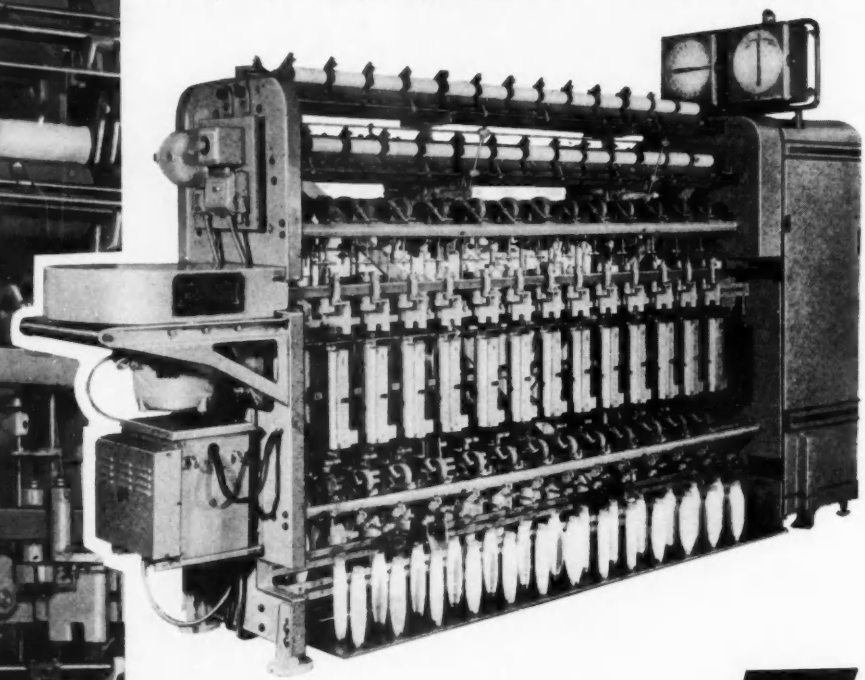

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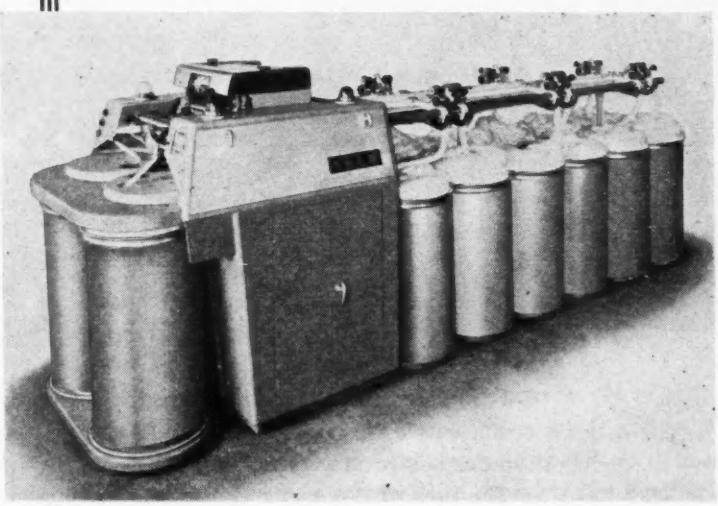

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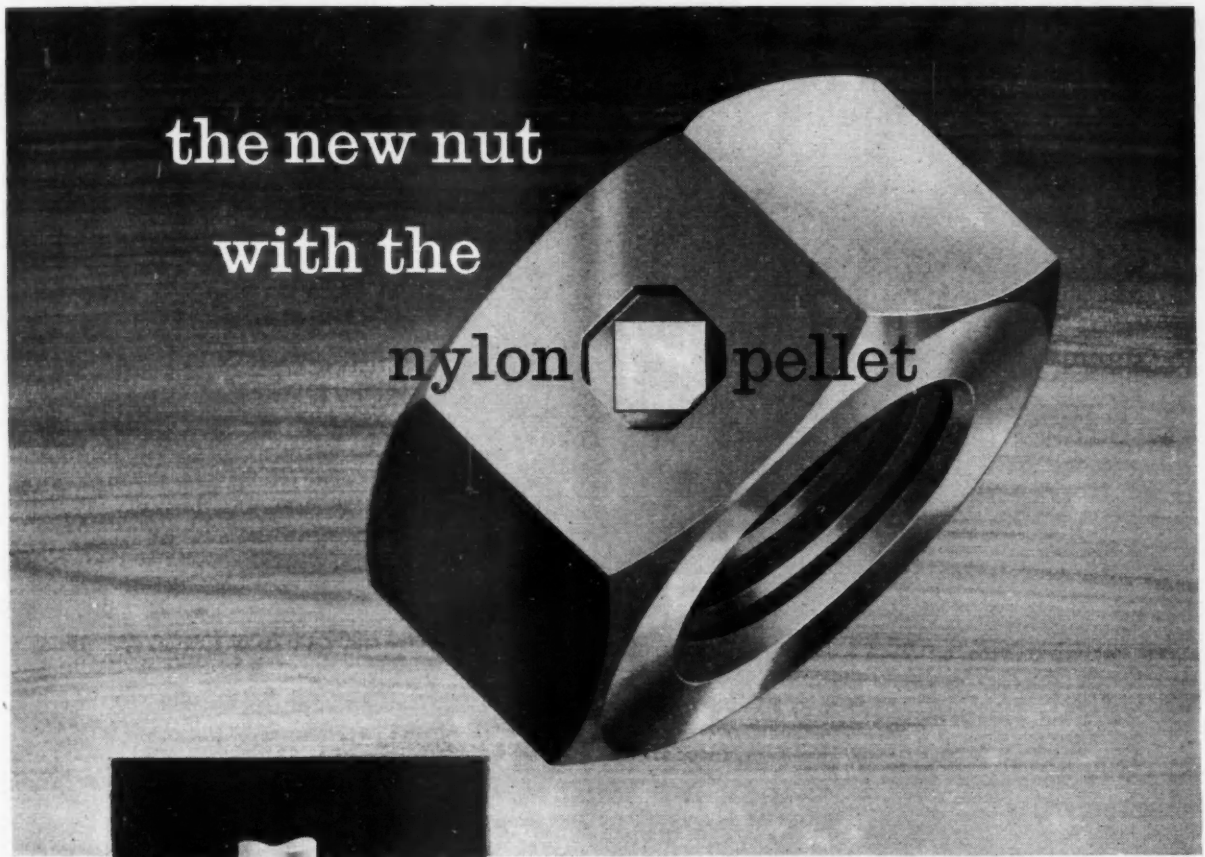

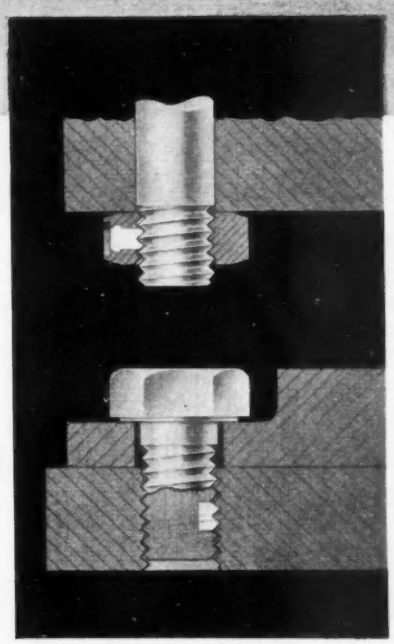

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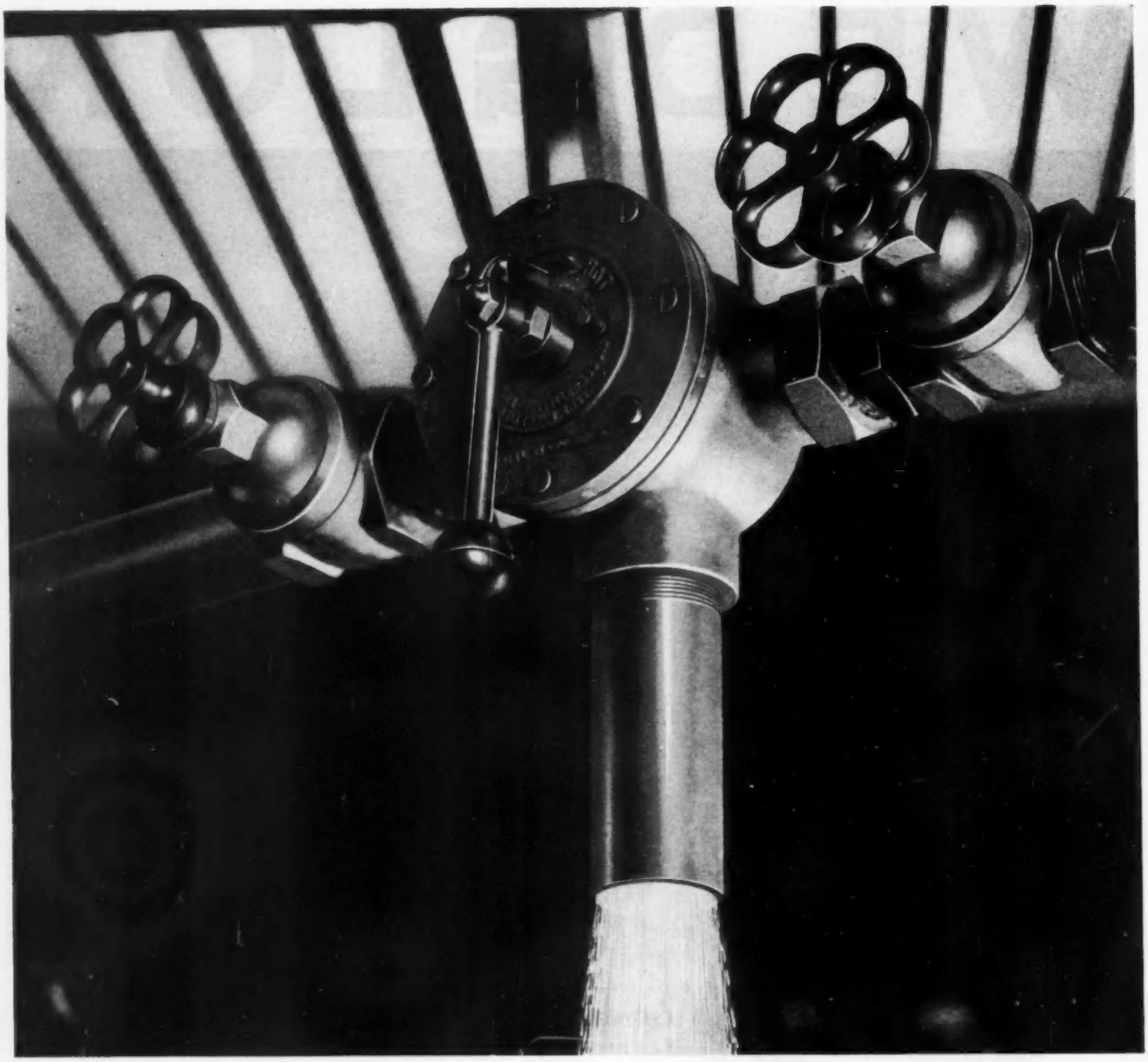

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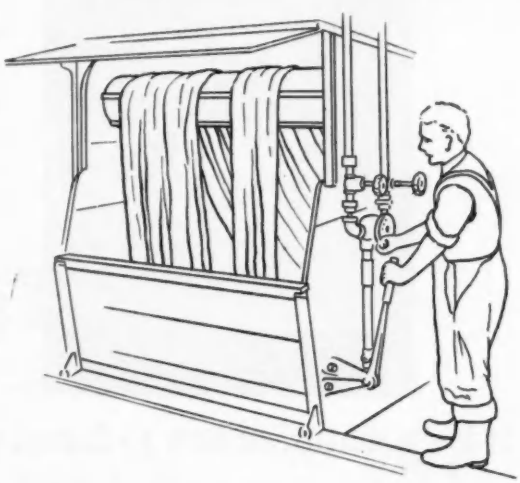

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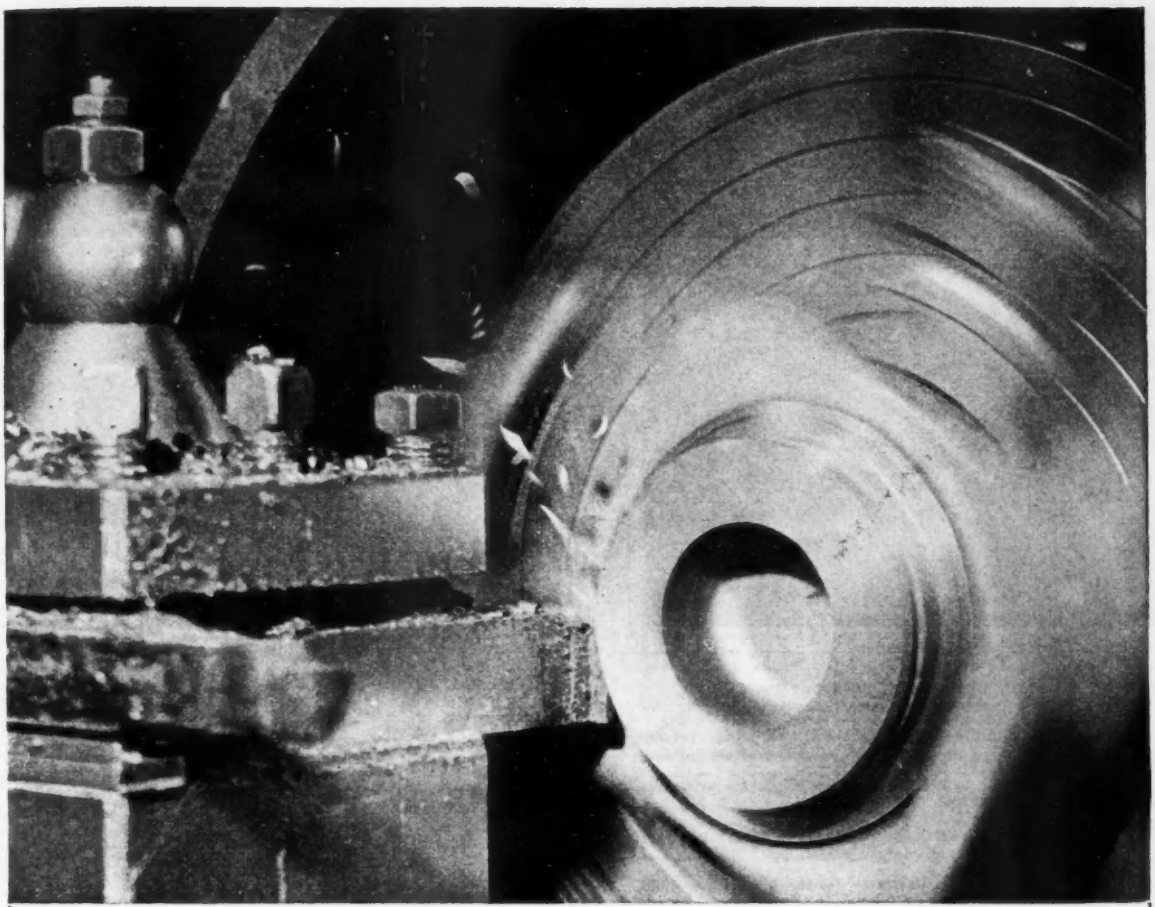

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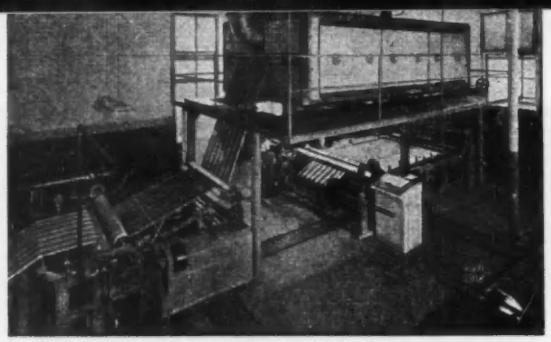

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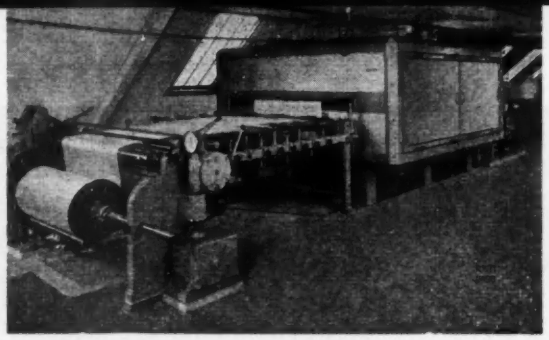

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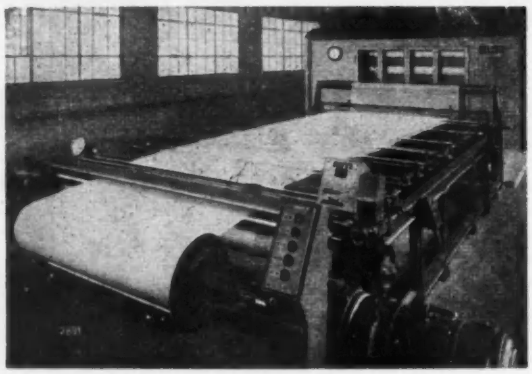

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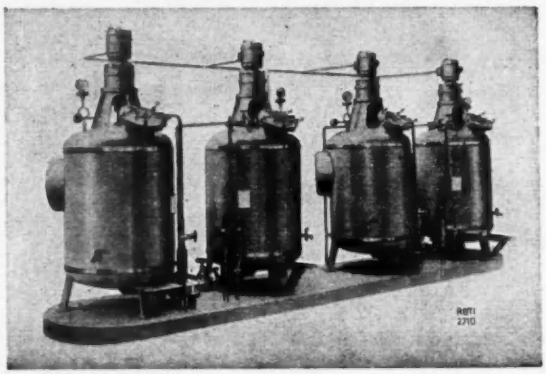

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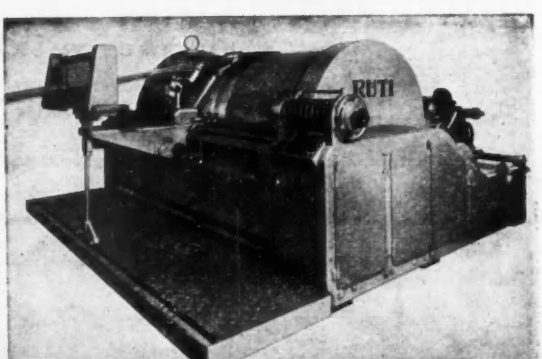

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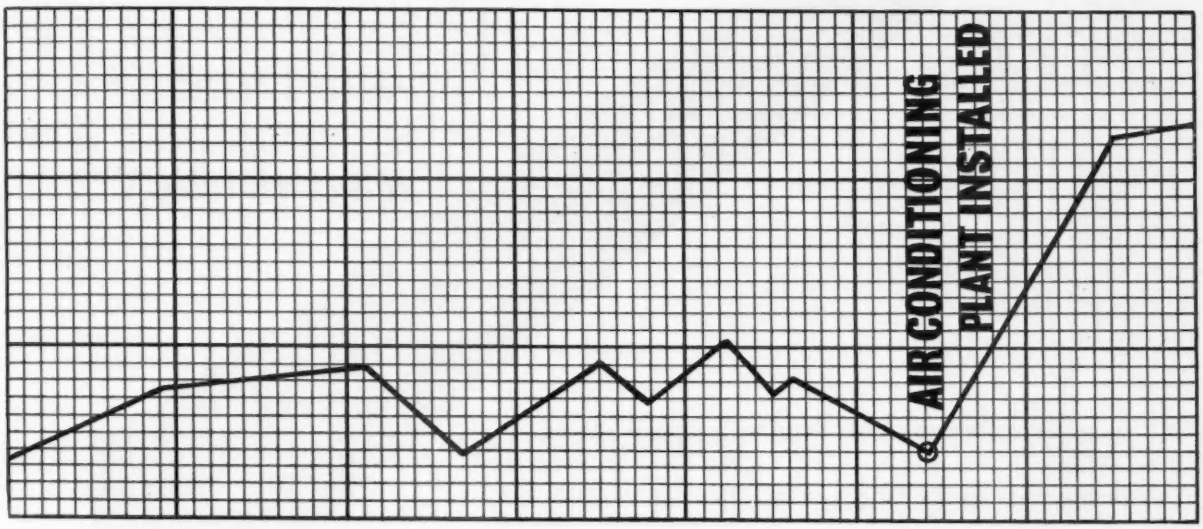

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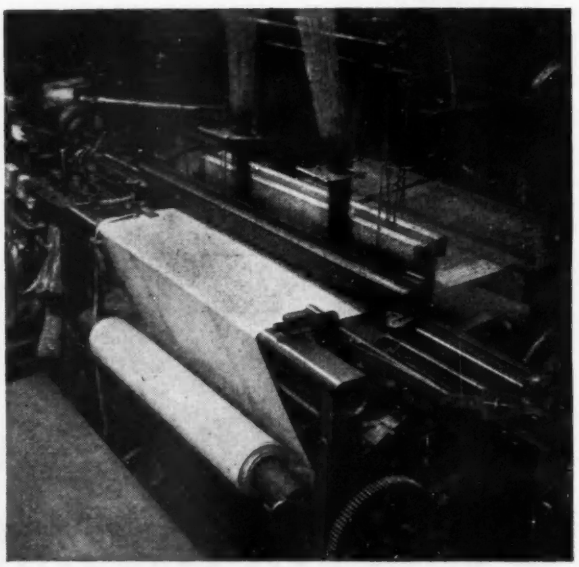

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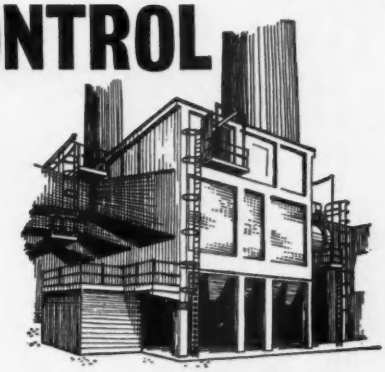

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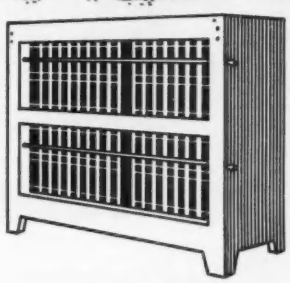

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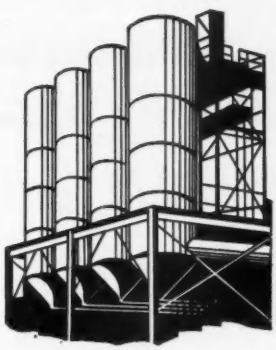

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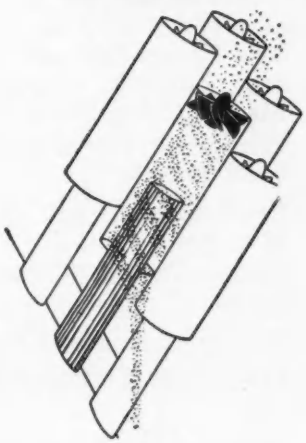

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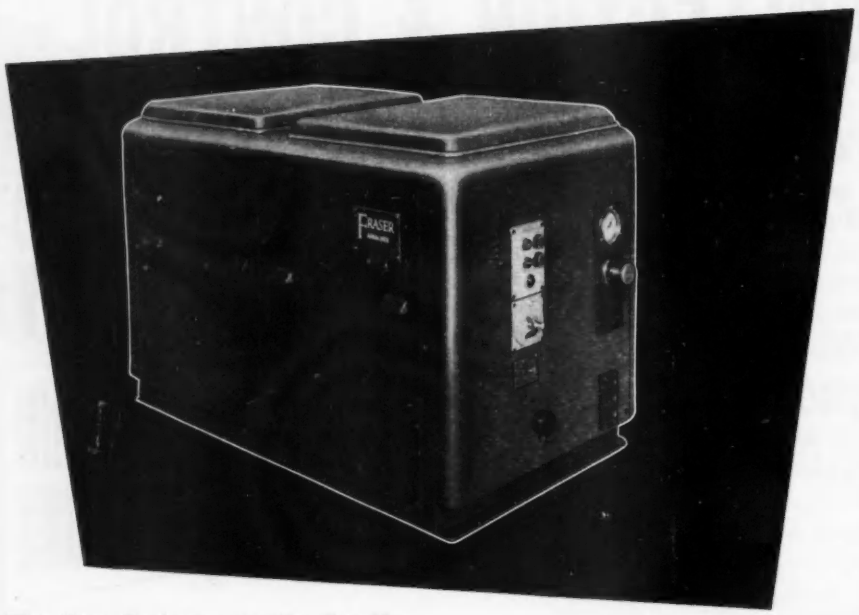

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- The Fraser Rapisonic Emulsion Plant is Compact and Efficient, Continuously and Automatically Manufacturing Oil-in-Water Emulsions.
- Changes in Proportions of Oil or Water Immediately Effective.
- For Use with Jute Softener or Goods Spreader Machines.
- Permits Use of Smaller Proportions of Emulsifying Agent.
- Eliminates Human Error & Reduces Labour Costs.
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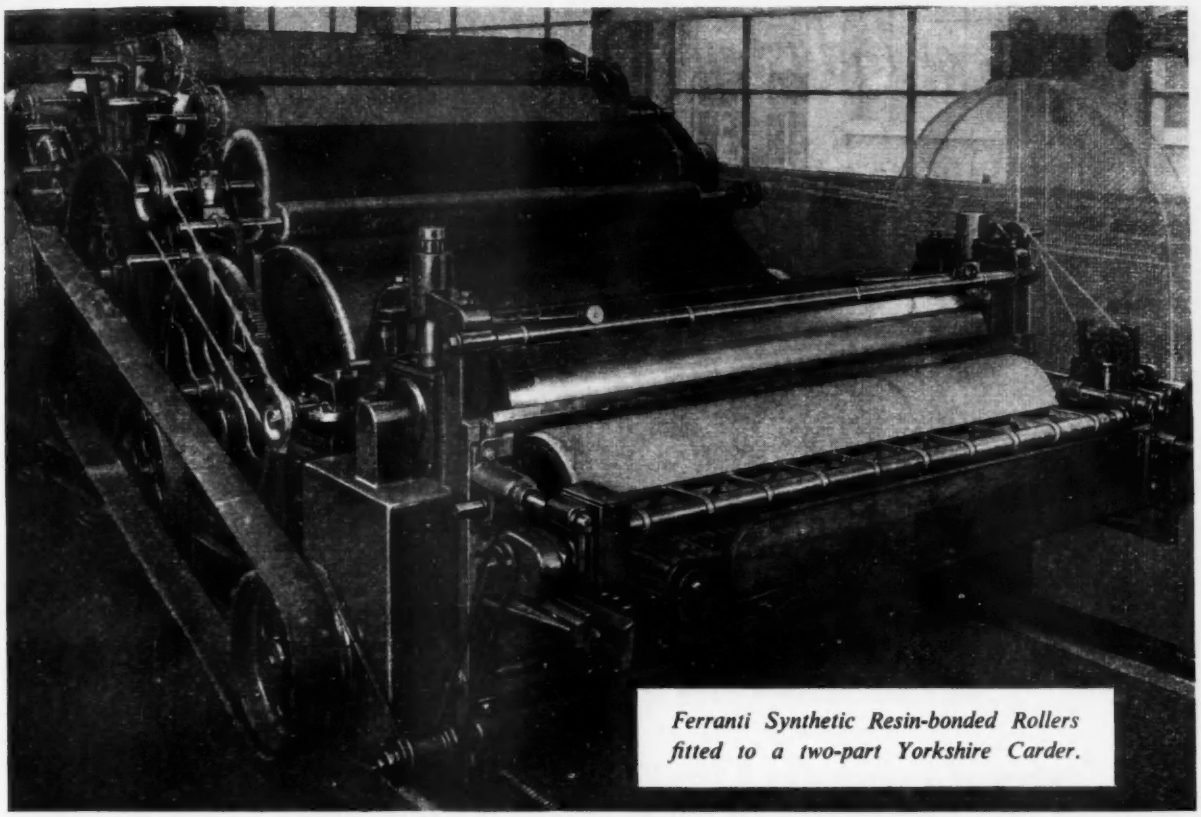
FRASER
ARBROATH

DOUGLAS FRASER & SONS LIMITED
ARBROATH **SCOTLAND**
PHONE ARBROATH 2033-5. ***GRAMS "FRASER" ARBROATH.***



Ferranti Synthetic Resin-bonded Rollers fitted to a two-part Yorkshire Carder.

SYNTHETIC RESIN-BONDED CYLINDERS & ROLLERS FOR THE TEXTILE INDUSTRY

Typical Ferranti Resin-bonded rollers.

Ferranti resin-bonded cylinders for the textile industry have high strength to weight ratio — smooth surfaces — ready machinability — resistance to mild acids and alkalis. These properties are suited to a wide range of applications in the textile field, including preparatory machinery, bleaching, dyeing and finishing processes.

A wide range of resin-bonded tubes for packaging is also available. The great strength of these tubes has been used to advantage in the processing of continuous filament yarns where high crushing stresses are found.

Sizes from $\frac{3}{16}$ in. inside diameter to 6 ft. inside diameter are available with any specified wall thicknesses.

Send for list IDS.2 which describes the cylinders and rollers in full.

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by

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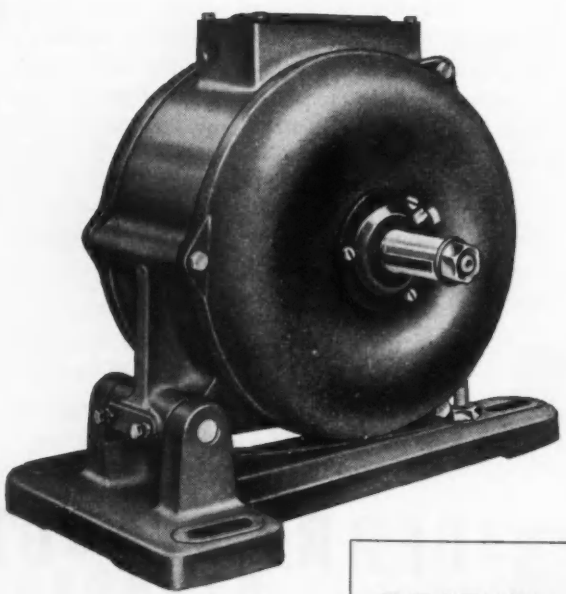
T-H

ELECTRIC MOTORS

in the textile mill

Whenever a power drive is needed, there is a BTH motor that will do the job efficiently and economically. In industries all over the world, BTH motors are helping to increase production. Over half-a-century's experience of this branch of electrical engineering enables BTH to offer the motor with the mounting, enclosure, rating and performance best suited to the application.



BTH factories are exceptionally well equipped to make both ***STANDARD*** *and* ***SPECIAL*** *machines in large quantities.*

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The Coventry Mark 5 chains ensure continuous, uninterrupted production. Their maintained accuracy of pitch and free articulation give smoother running, more accurate operation and freedom from costly production hold-ups due to transmission failure. Whether for driving or conveying, fit The Coventry Mark 5 chain and banish the breakdown bogey.

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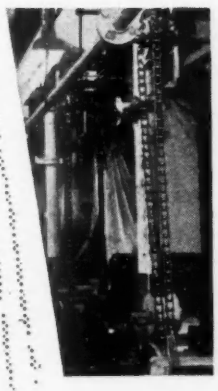

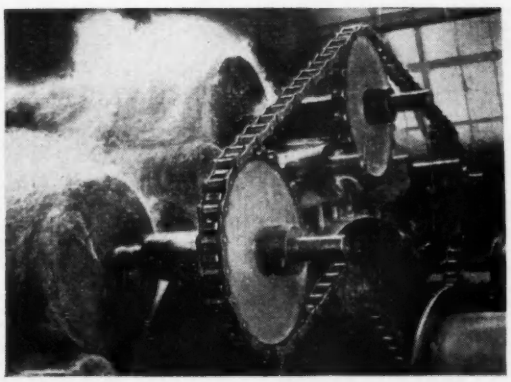

RENOLD — *the FIRST name in precision chain*

RENOLD CHAINS LIMITED · MANCHESTER

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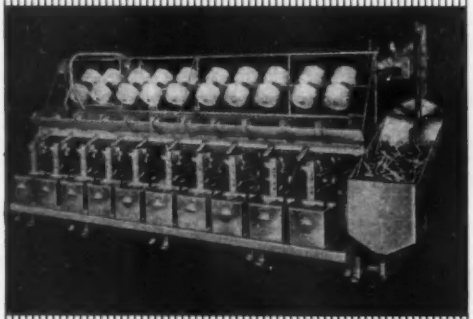
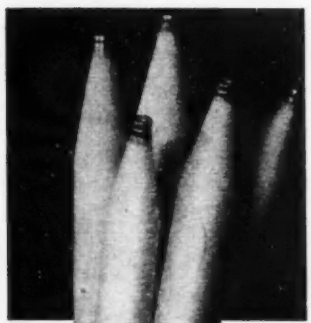
Schärer wound pirns a real help to loom efficiency





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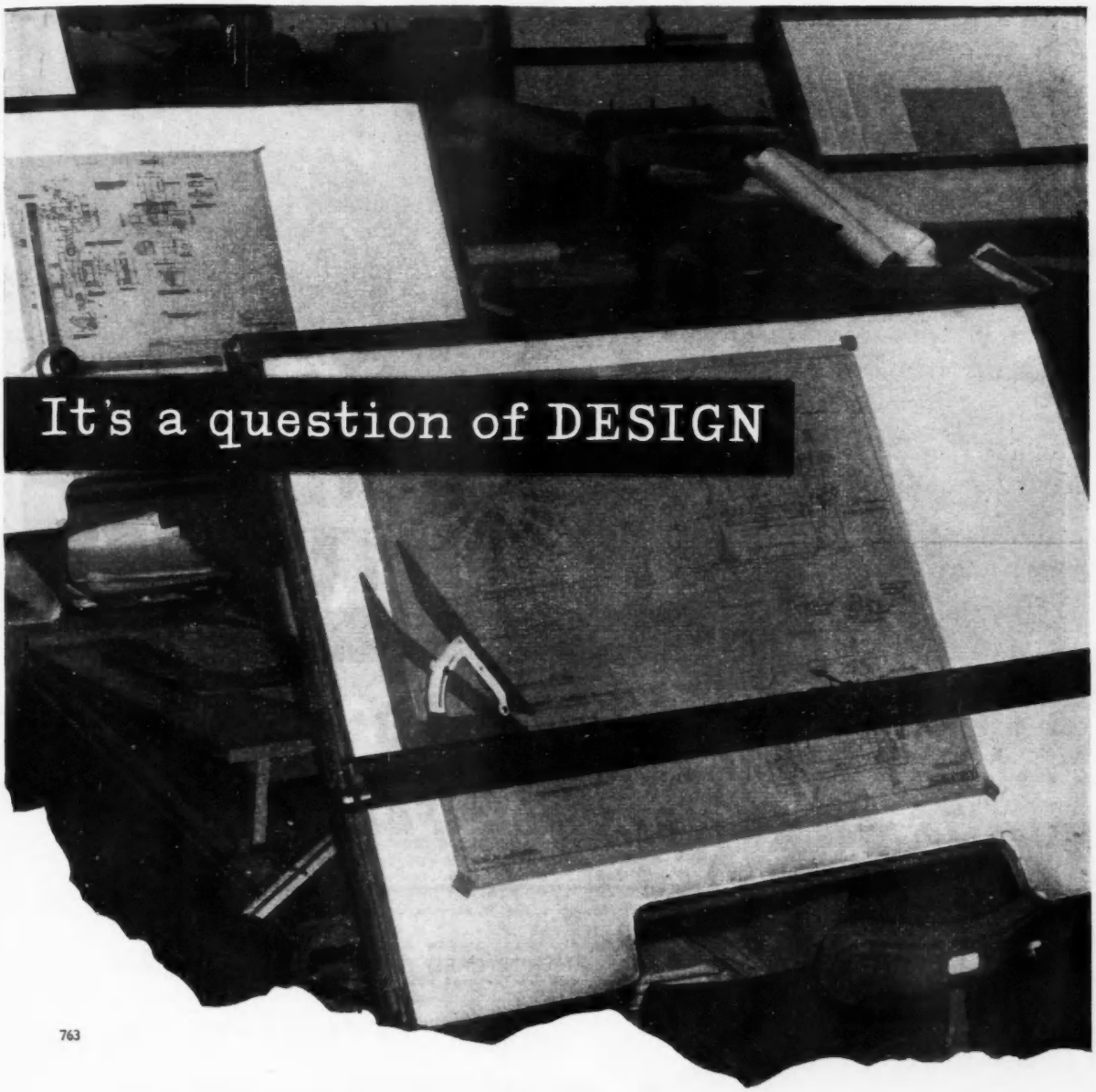
Erlenbach-Zurich Switzerland

Sole British Agents: G. W. Thornton & Sons Ltd., 10 Eden Place, Cheadle, Cheshire. Tel. : GATley 4271



Mather & Platt Ltd. are engaged on projects of special importance to the textile finishing industry. The latest development is an entirely new pitching device for printing machines, the designs for which are now in an advanced stage of preparation.

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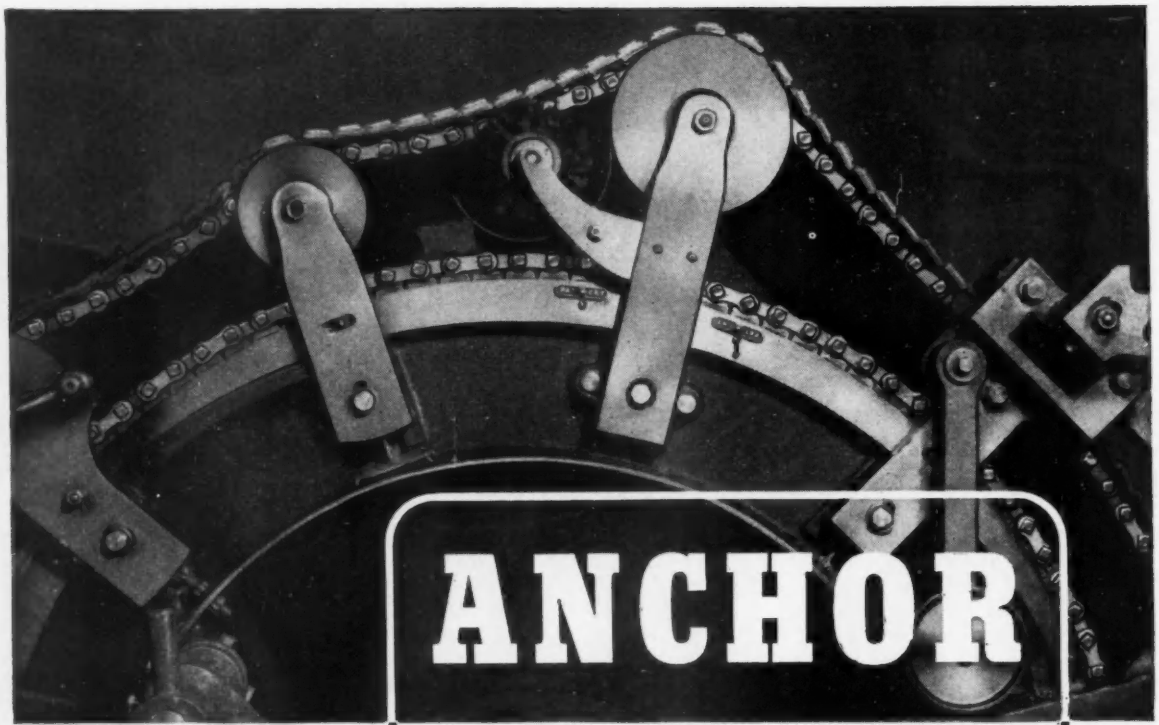

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A NEW SERVICE

Chains are now supplied boxed in pairs, for cleanliness of handling and storage. Right and left hand screws are also available, thus ensuring a 100% job.

ANCHOR CARD CHAINS ARE MANUFACTURED FROM HIGH QUALITY STEELS WHICH ENSURE LONG LIFE AND FREEDOM FROM BREAKDOWN. SIZES AND LENGTHS TO SUIT BRITISH, CONTINENTAL AND AMERICAN MACHINES.

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. . . and the Belleville makes it possible . . . !

The largest capacity spring balance in the world. This instrument was made to weigh giant steel castings and is graduated up to 200 tons with 1 ton sub-divisions. It is approved by the Board of Trade for "Trade" purposes, where the requirement is that the machine must be accurate to within a quarter of its smallest sub-division.
Two Belleville washers, in this instance opposed to each other, supply the spring resistant. Their total movement under full load of 200 tons is never more than $\frac{1}{16}$ of an inch.

SALTER . . .

. . . always a spring ahead!

★ When resistance to load or thrust is beyond the capacity of helical springs,

★ When take-up of shock or sustained load must be restricted to very slight movement,

★ When many tons of dead load must be sustained plus intermittent shock or live load . .

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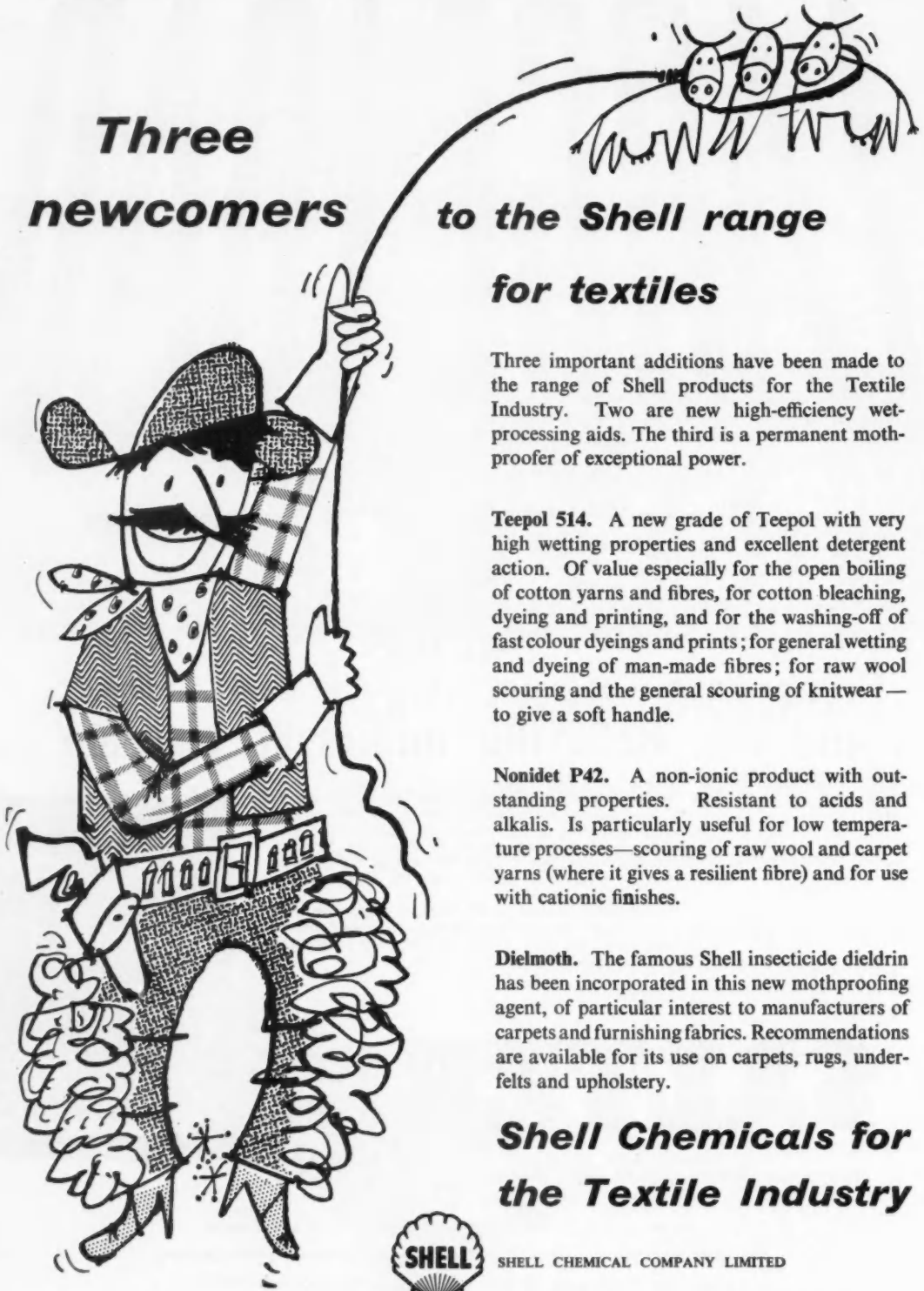
GEO. SALTER & CO. LTD., WEST BROMWICH, ENGLAND . ESTABLISHED 1760

Three newcomers to the Shell range for textiles



Three important additions have been made to the range of Shell products for the Textile Industry. Two are new high-efficiency wet-processing aids. The third is a permanent moth-proofer of exceptional power.

Teepol 514. A new grade of Teepol with very high wetting properties and excellent detergent action. Of value especially for the open boiling of cotton yarns and fibres, for cotton bleaching, dyeing and printing, and for the washing-off of fast colour dyeings and prints; for general wetting and dyeing of man-made fibres; for raw wool scouring and the general scouring of knitwear — to give a soft handle.

Nonidet P42. A non-ionic product with outstanding properties. Resistant to acids and alkalis. Is particularly useful for low temperature processes—scouring of raw wool and carpet yarns (where it gives a resilient fibre) and for use with cationic finishes.

Dielmoth. The famous Shell insecticide dieldrin has been incorporated in this new mothproofing agent, of particular interest to manufacturers of carpets and furnishing fabrics. Recommendations are available for its use on carpets, rugs, underfelts and upholstery.

Shell Chemicals for the Textile Industry

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TEEPOL, NONIDET and DIELMOTH are trade marks.

TX1

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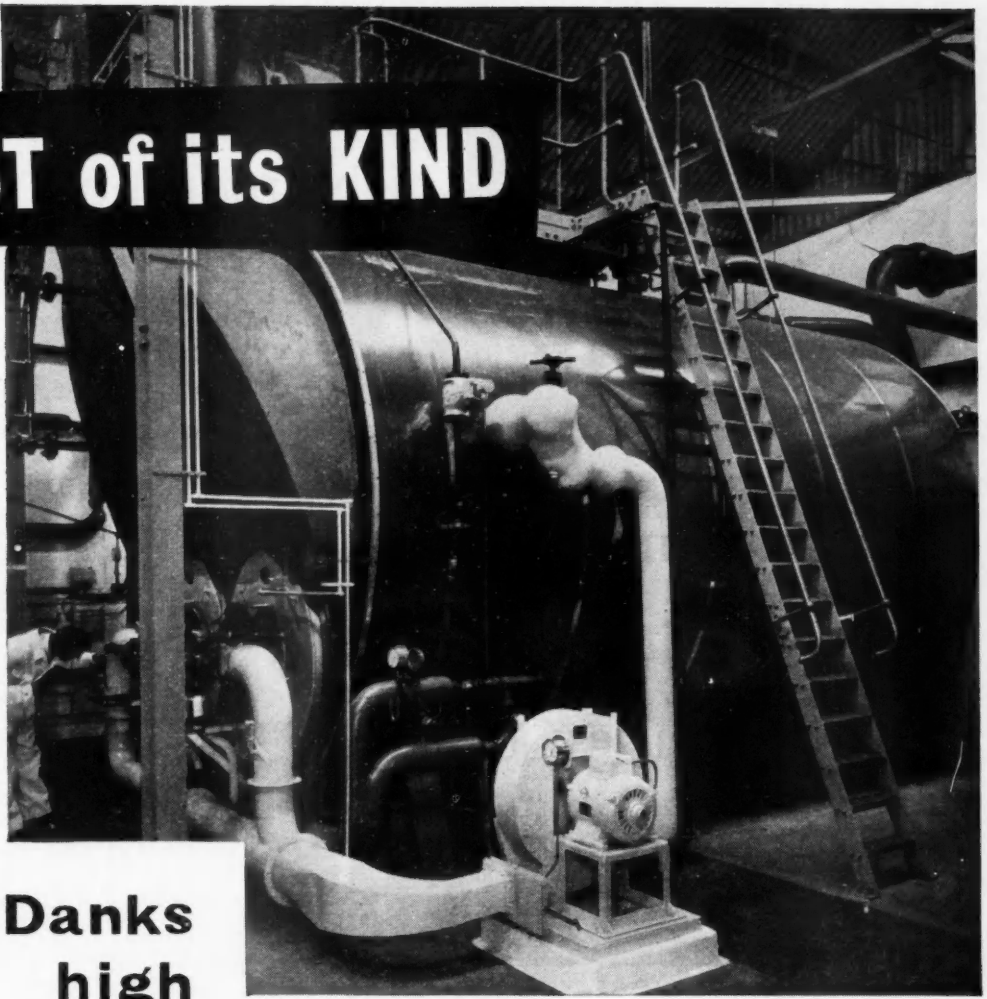

At the Quaker Oats Factory, Southall, Middlesex, direct injection cookers and rotary grain driers are served by steam which is also used for the heating of factory and offices. A widely fluctuating steam demand is achieved by the installation of this special oil-fired boiler.

Edwin Danks high velocity THERMAL STORAGE economic BOILER

Working at 250 psi pressure, the boiler has a normal output of 15,000 lbs. of steam per hour but can work at a 25% overload rating when necessary. Variations in steam demand are dealt with by the thermal storage of hot feed water which enables the factory load to be evened out and the firing rate kept constant. Substantial fuel economies and increased efficiency are obtained without the use of expensive and bulky accumulators or additional tanks. Designed for coal or oil firing.

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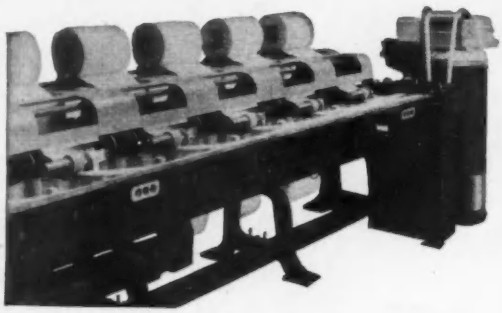
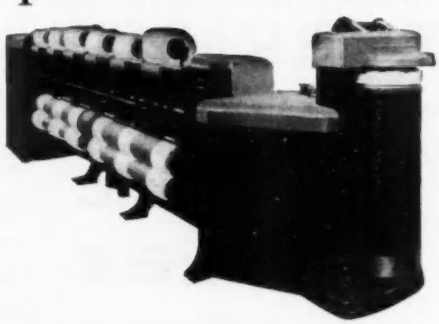


the **"HARTFORD"** high production comber.

A six-head machine capable of productions of up to 44 lb./hr. with speeds of only 116 nips/min. and efficiencies of over 90% with waste extraction from 6% low—to 25% high.

Highest comber production per unit of floor area is achieved. Quality is maintained at lower waste extraction.



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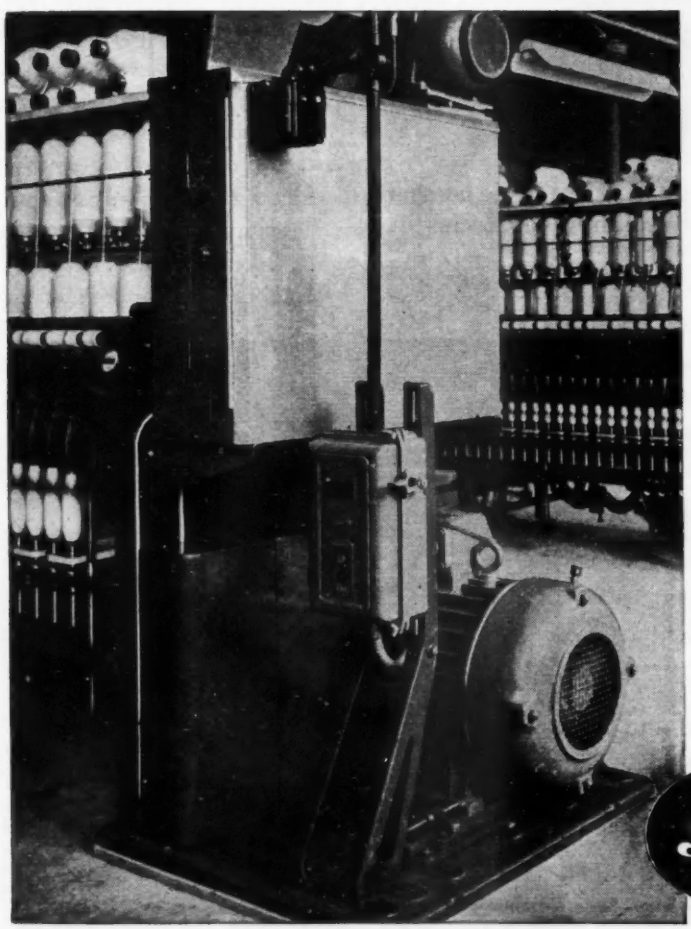
MARKETING THE TEXTILE MACHINERY MADE IN THE WORKS OF PLATT BROTHERS & CO. LTD. HOWARD & BULLOUGH LTD. DOBSON & BARLOW LTD.

generating plant · transformers · switchgear
motors · cabling · lighting



service to industry

G.E.C.

textile electrification

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

DUST SUPPRESSION

and fibre preconditioning by the

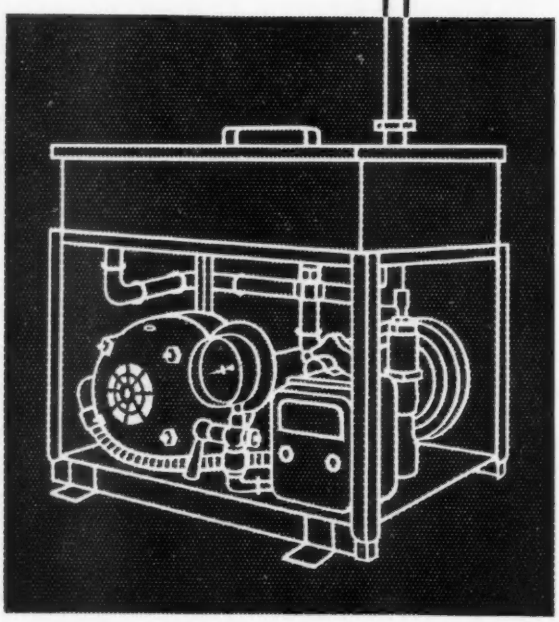
PUREMOR METHOD

The PUREMOR Method has been so long established in a large number of mills as to warrant our confidence that our claims concerning its effectiveness are justified. These are—

CONTROL OF DUST

REDUCTION OF WASTE

AID TO PROCESSING



We also claim that our PUREMOR grades of oil are admirably suited to the preparation of WEAVING sizes and offer distinct advantages. We have many users who support these claims. Perhaps we can help in your Mill. If you will send us brief details of machinery used and a note of the type, grade and staple of fibre being processed we will bring our wide experience to bear on your problem.

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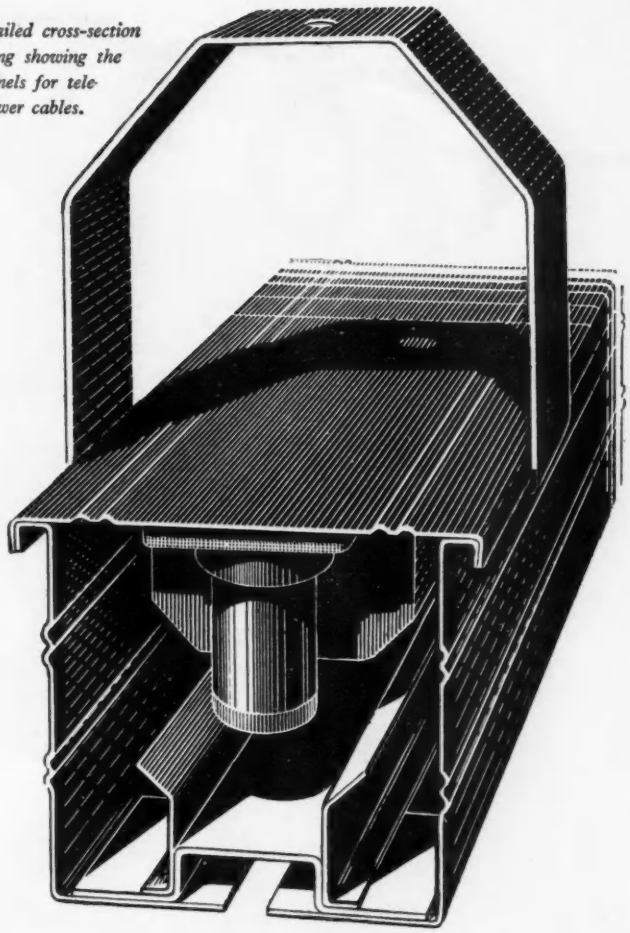
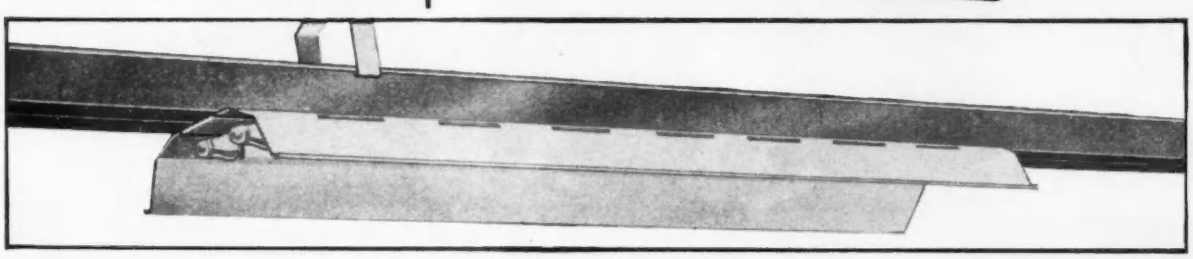
EKCO's Universal Industrial Lighting Trunking gives the neatest approach to problems encountered in planning lighting in extensive factory spaces. Designed to provide high illumination levels over large areas, its compact form and easy assembly cuts installation costs. A variety of reflectors can be incorporated and provision is made for housing power cables and telephone lines. The system makes provision for the use of various types of Lampholders.

This is a detailed cross-section of the trunking showing the separate channels for telephone and power cables.





Have you a lighting problem?

Then the EKCO Lighting Advisory Service is available to help you. There is an office in your vicinity. So ask us to send a qualified lighting engineer to discuss your problem with you. There is no obligation and the service is entirely free.

EKCO Trunking System

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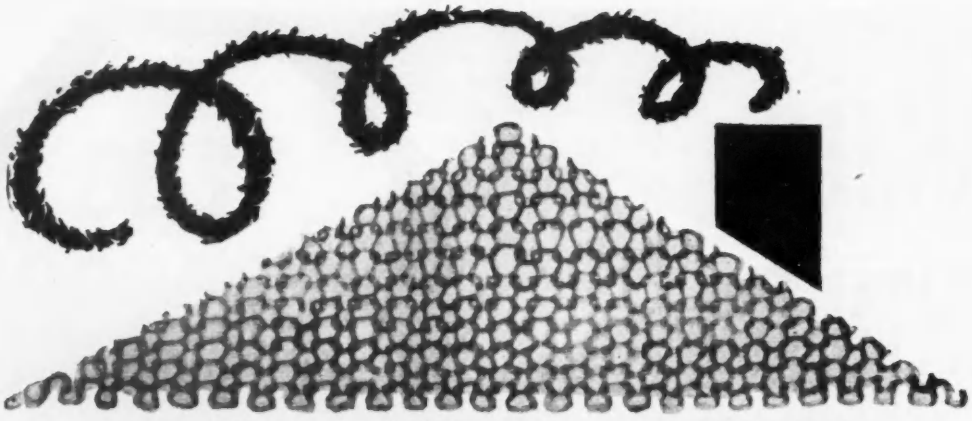

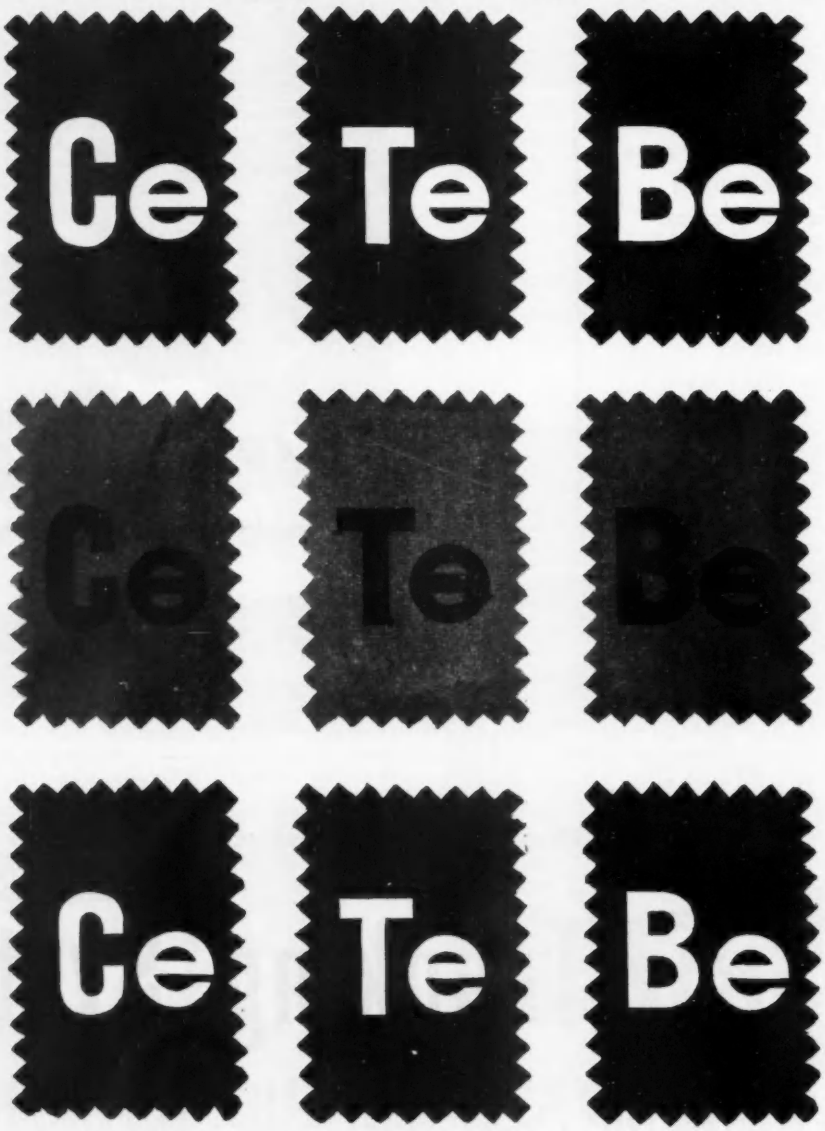

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CETEBE recommends its wide range of quality cotton and vigogne carded fabrics in fast and attractive colours.

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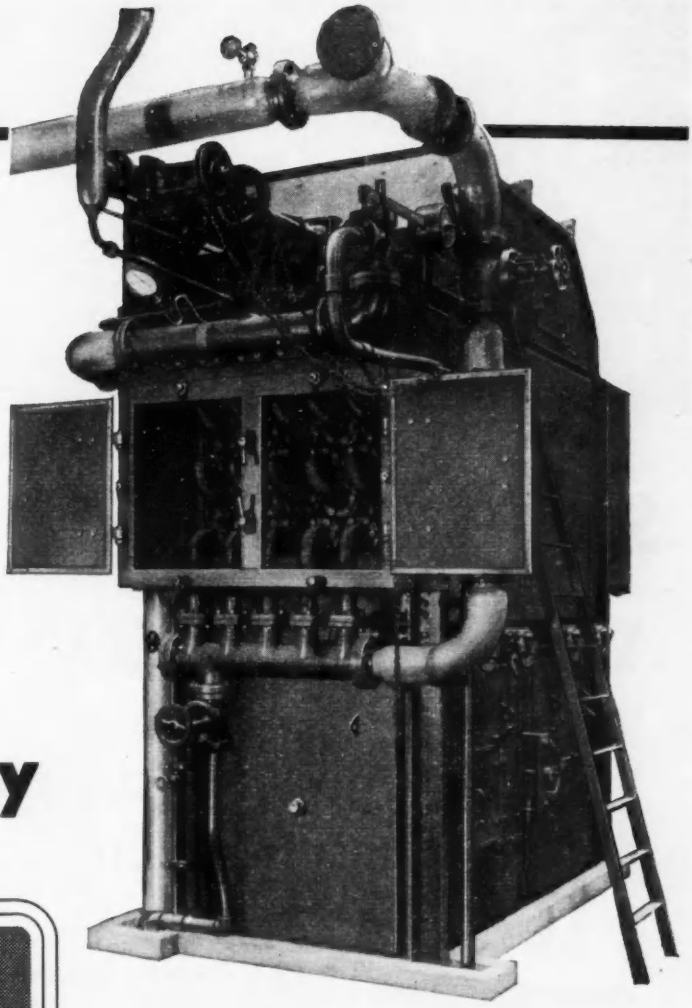

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GREEN'S ECONOMISER

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Over a hundred years' experience behind it. Thousands of installations with all types of boilers all over the world. Millions of tons of coal saved.

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Makers of Economisers for more than One Hundred Years

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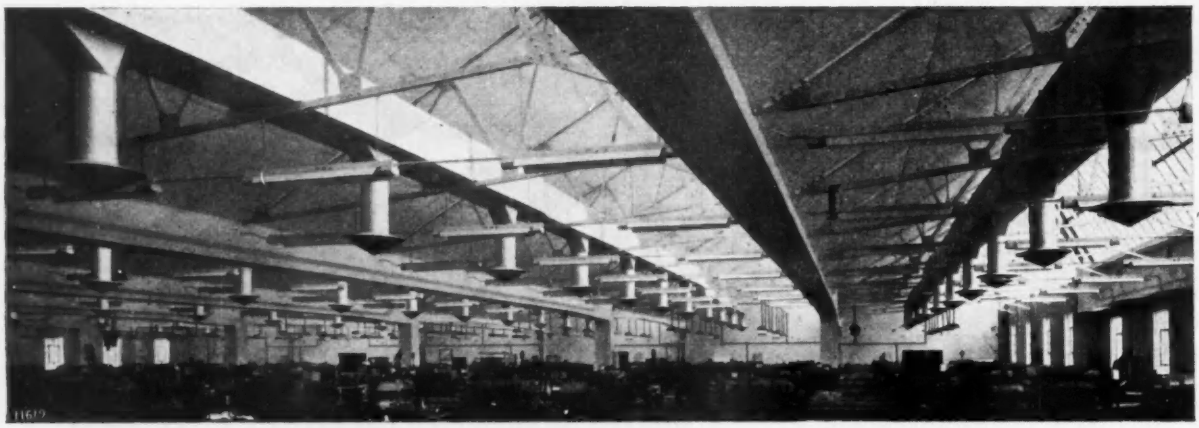

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AIR CONDITIONING PLANT

. . . provides complete control of atmospheric conditions.

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- Higher Production
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- Unsurpassed Sliver Quality
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- 8 heads, single side
- Extremely precise construction
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- Bi-Coil or single sliver
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- Production 40 lbs. per hour
- Speed 150 nips per minute
- Simple to operate
- Efficiency up to 97%
- Low production cost lb.
- Maintains settings between annual overhauls
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- All heads set identically

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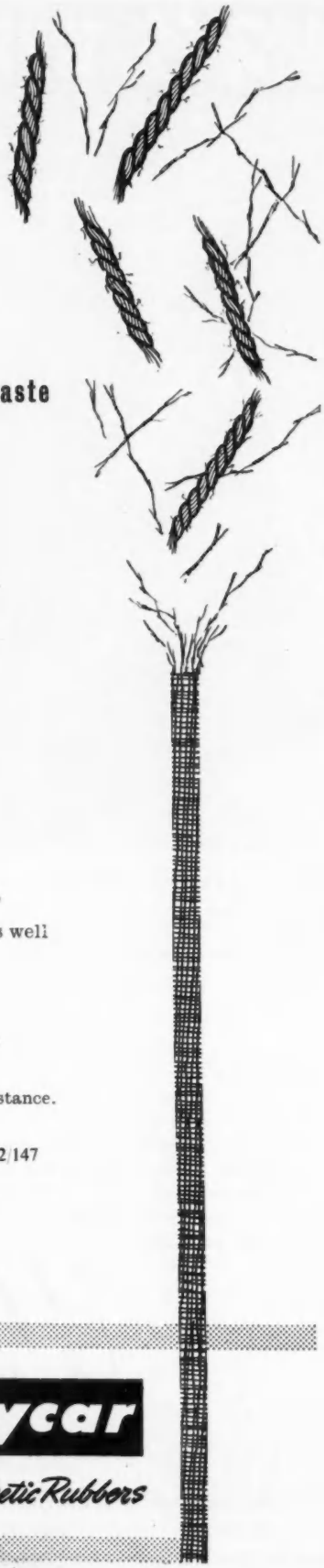
makes fibres into fabrics

without weaving . . . without felting . . . without waste



'Chamois' that never saw a goat;
jacket interlinings that never show a crease;
skirt stiffeners that always recover from wrinkles—
these are just a few of the non-woven fabrics
made possible by bonding fibres with HYCAR latex.
The recommended process is simpler than felting
and most economical in its use of fibre.
Any of the natural or synthetic fibres
—cotton, wool, nylon, rayon, acetate—can be
bonded separately or mixed.
To all of them HYCAR imparts excellent washability,
high tear strength and resistance to dry cleaning as well
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There is a HYCAR latex for permanent warp sizing of yarns;
providing a full hand; reducing crocking;
binding pigment colours; ensuring crease and wrinkle resistance.
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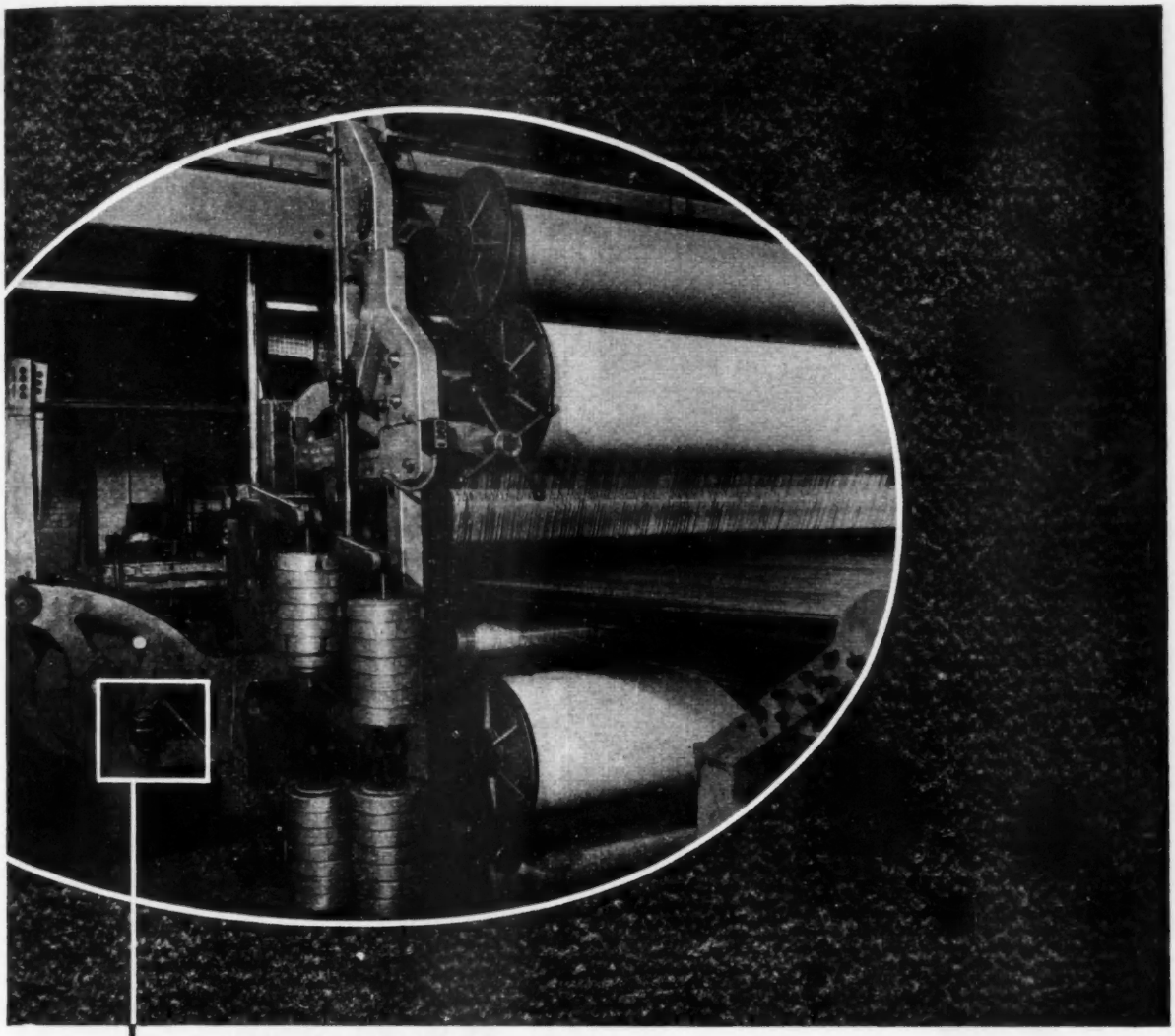
Hycar
Synthetic Rubbers



At the works of Messrs. Wilson & Longbottom of Barnsley, this loom weaves Wilton Carpets on the Face-to-Face principle, the pile yarn being cut to separate them. The loom is fitted with a Tecalemit " Bijur " semi-automatic Lubricating System.

NO CHANCE OF OIL SPOTTING

WITH TECALEMIT AUTOMATIC LUBRICATION

Tecalemit Automatic Lubrication has now replaced old-fashioned, messy, oiling methods on many textile machines. On this intricate carpet loom there are 75 oiling points to which oil is metered cleanly and efficiently, by the Tecalemit " Bijur " System. Each point receives at regulated intervals the exact quantity of oil needed.

Every bearing and friction point is maintained at its full efficiency, unproductive stoppages for hand lubrication are unnecessary, and spoilage of valuable carpeting by oil spotting is avoided.

The " Bijur " System — one of several Tecalemit Systems — may be entirely automatic or controlled by a single hand pump. It is particularly suitable for many types of textile machinery.

Our Technical Department will be glad to advise on the type of system most suited to your needs.

TECALEMIT AUTOMATIC LUBRICATION

TECALEMIT LIMITED · PLYMOUTH · DEVON

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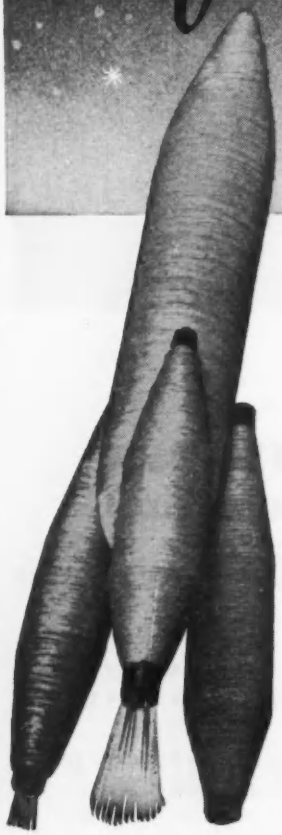
LAWSON DYED Yarns in future!



COLOURED YARNS
FOR ALL PURPOSES

All the natural and man made fibres, dyed either to your own special requirements, or in our standard shades and qualities.

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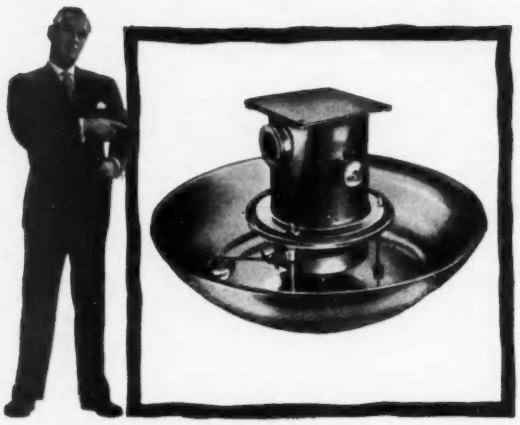

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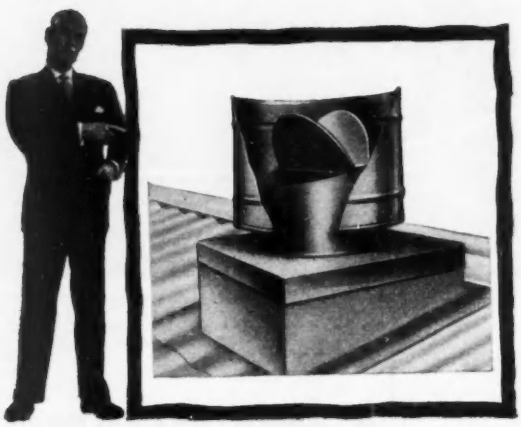
A new humidifier which has already proved of immense value to many industries from Textiles to Tobacco. The Aerosol-Turbo gives trouble-free, controlled humidification, without wetting or water tracking. May we demonstrate this machine at your premises ?



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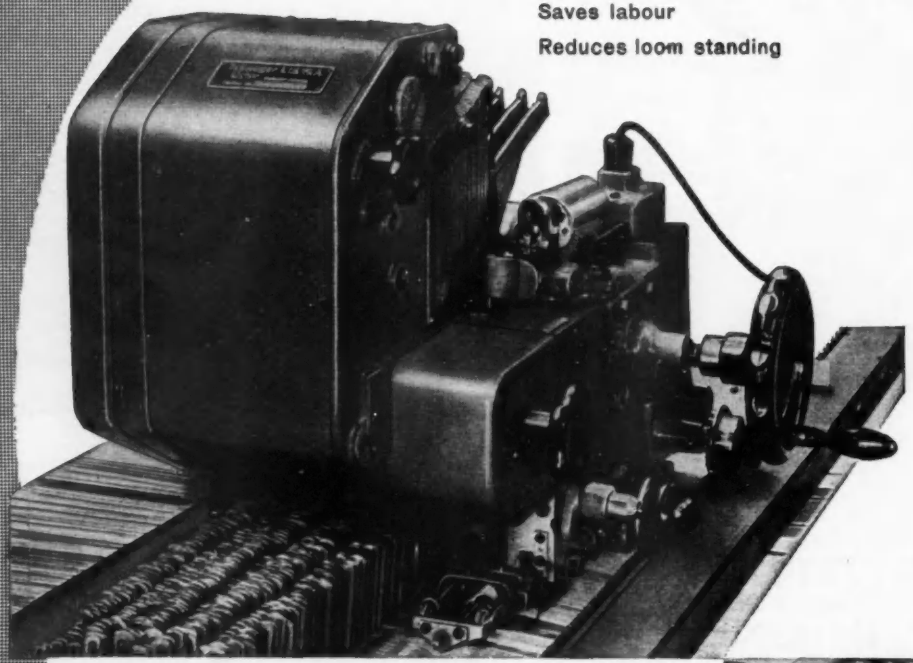

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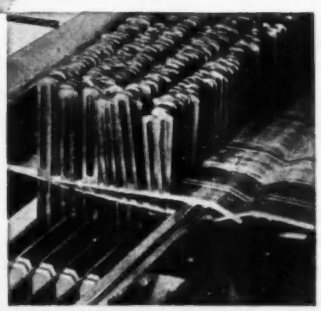

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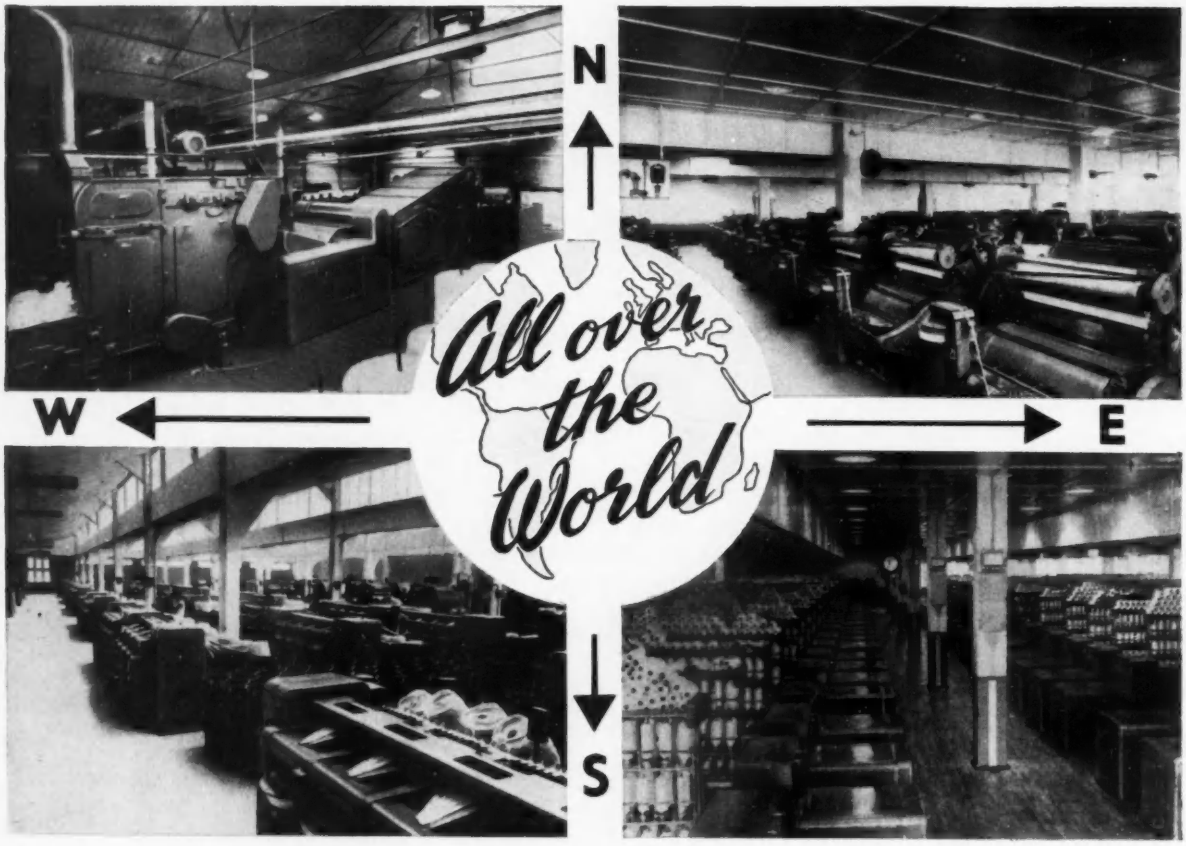

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THE TEXTILE MANUFACTURER

MATERIALS - PROCESSES - PRODUCTION - MANAGEMENT

NO. 997. VOL. 84 - JANUARY 1958 - MONTHLY Two Shillings and Sixpence

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THE TEXTILE MANUFACTURER (*Incorporating* TEXTILE INDUSTRY AND EXPORTER, THE TEXTILE MACHINIST, THE HOSIERY, LACE AND SILK MANUFACTURER, *and* THE TEXTILE COLOURIST) is published on the first Monday of every month.

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THE TEXTILE MANUFACTURER

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Notes of the Month

DISTRIBUTION PROBLEMS IN TEXTILES

PREPARED on the initiative of the textiles committee of O.E.E.C., and sponsored by the European Productivity Agency, a preliminary report, compiled by Professor G. Tornquist of the Stockholm School of Economics, examines the distribution problem in textiles. The first section of the report reviews the general problems and submits certain suggestions for possible future action whilst the second part comments briefly on distribution conditions in Belgium, France, Germany, Italy, the Netherlands, Sweden and the U.K. This also gives some useful information on past and present activities. On the question of distribution costs, the report points out that factual knowledge of distribution links as such is rather meagre but even less is known about relations between the links and the influence they might have on costs and productivity. A study of how different cost items are accounted for in a distribution establishment would show that the smaller part of them could be described as *distance costs* (ingoing and outgoing freights), or *time costs proper* (e.g., interest and rent for storage rooms, interest on credits granted), whilst by far the larger part could be labelled *transaction costs*, which among other things entail buying and selling operations, clerical work in connection with orders, and physical handling of goods. A comparison might be made with traffic costs, which are subdivided into distance costs pertaining to the transit itself, and terminal costs connected with starting and finishing the transit—receiving goods and loading and unloading at the respective ends of a voyage.

The fact that transaction costs mainly require human effort explains the dominating role of personnel costs in distribution (generally 50–60% of total cost, according to American wholesale and retail studies). Such items as rent and interest, which nearly always rank second and third among the cost items, are mainly of a time character, i.e., time for storing goods, time for credit granted. A study made in the U.S. covering wholesale and retail distribution of groceries indicated that such contact costs represented about 75% of all costs, except ingoing freights. The author's own experiences of Swedish wholesaling in several lines point in the same general direction, the only difference between lines of trade being that in some handling costs predominate while in others selling contracts form the greater part; this would appear to be the case in textile wholesaling.

Drawing attention to probable influences in the distribution chain, the report says that inside an industrial firm, one of top managements primary functions is to be the umpire in problems of policy between the representatives of the production and the marketing side. Both parties are anxious to emphasise the importance of their own spheres of interest and, consequently, tend to be somewhat blind to the opposing point of view. The same applies to wholesale and retail enterprises with conflicting ideas on buying and selling. A production manager may wish to limit the variety of items produced because he knows runs of different lengths have a definite influence upon unit cost. On the other hand, the sales manager might want to increase the number because he knows assortment betters his chances of competing with rivals for customers—wholesalers, retailers or consumers. The remedy, according to the report, would be to let both parties feel the effect of both sides of economy. Production should be judged not by one single unit cost of each product or type of products, but also with due consideration for such problems of structure as length of runs, which production men do not control. In the same way, marketing should feel *immediately* and not only as a long-term overall effect, the influences on production cost which arise from the marketing structure.

As most textile industries are influenced on their production programme planning by the preferences of individual customers, they need costing systems also embracing variables arising from the marketing side, which will help them to understand not only their own internal problems but also those of their marketing channels. This does not in all cases mean a job order cost system but it certainly means factual studies of the cost structure as influenced by size and time of the order. The basic cost unit to which the costs are allocated should no longer be identified only with a product technologically but also with it under varying conditions of distribution.

Commenting on the problems connected with selling, the report emphasises that retailers in many countries have adopted the policy of price fixing but this trend has put suppliers in a difficult position in that small and medium sized retailers have usually been offered goods at virtually equal prices, but manufacturers have often been willing to grant considerable price concessions to a number of big customers (multiple shops, department stores and mail order firms). It is not improbable that this price policy of the suppliers has created certain disadvantages for the medium-sized retailer employing a number of staff compared with the very small or one-man shop. Conversely, it is possible that certain aspects of the purchasing or sales policy of the big retailing firm are sufficient reason for the price concessions they receive. The author suggests manufacturers should examine the differences between small and medium-sized customers as regards their own costs for different categories of customers and, furthermore, those costs that are conditioned by the size of the order handled. The

differences in cost are much greater between the small and medium-sized customer than between the medium sized and the large retail organisation. In so far as the multiple stores create a more uniform line of goods in their shops and so enable large deliveries and production in long runs to be made, it is quite probable that the low prices offered are reasonable from a "static" point of view and, on the other hand, the low prices given to department stores are reasonable from the "dynamic" point of view.

Irrespective of the various causes of unsuitable structure in distribution, everybody will, in a normal competitive situation try to press his own cost disadvantages backwards to his supplier—from retailer to wholesaler and from wholesaler to the sales department of the manufacturer. Suggesting that manufacturers should be held principally responsible for policy-making activities in other sections besides that of manufacturing, the author gives two basic reasons. First, manufacturers have a greater vested interest (high fixed capital, long investment periods and very often a low degree of alternative use). Secondly, because industry has relatively larger enterprises which in turn employ more skilled personnel and have specialised management.

In conclusion the author submits for consideration a number of research projects, including investigation of the sales turnover of the different main categories of textiles through different types of retail outlets. Another project is investigation of the relationship between production and distribution costs of manufacturing firms and the length of runs and the time available between reception of an order and delivery date for that order. The investigation could be limited to a few firms in each section (cotton and wool weaving, making-up men's garments, making-up light clothing). A study in O.E.E.C. member countries of the absolute prices from factory and over the retail counter for a number of textile products of comparable quality is also mentioned. Another project would be a study of the problem of sizes for ready-made garments, also a study of the motivations underlying the general production and price policies of leading producers.

* * *

SCOTTISH WOOLLEN MILLS HARD HIT

PROBLEMS affecting the export of Scottish woollens and particularly the adverse effects of the United States tariff quota, were discussed at an informal meeting in Edinburgh on December 13 between Sir David Eccles, President of the Board of Trade, and members of the Council of the National Association of Scottish Woollen Manufacturers. Mr. J. R. Scott-Noble (president of the Association) told Sir David that while the Scottish woollen industry was comparatively small in that it operated only about 10% of the looms in the U.K., it concentrated on high class, high quality goods with the result that there had always been a strong demand for them from overseas. Since the war, the industry had steadily increased its exports until last year when they reached an all-time record and amounted to very nearly half the industry's total production. This proportion compared with only 25% over the woollen textile industry as a whole. "That did not happen by accident," said Mr. Scott-Noble. "We have put in a tremendous amount of effort to expand export markets and with, I claim, considerable success. It indicates how important such markets are to us."

After referring to quota, tariff and other restrictions encountered in such markets as the U.S., Canada, France, Japan and South America, Mr. Scott-Noble said there was no doubt the industry was suffering from severe difficulties. Already there was an appreciable amount of short-time working in Scottish mills. Scottish mills accounted from 25 to 30% by value of all British woollen exports to the United States last year—a very creditable performance in view of the size of the industry. For the first seven months of this year, last year's figures had been very nearly maintained, but since July, because of the tariff quota, deliveries had slumped to less than one-third of the average. He feared that owing to the uncertainty of the operation of the quota, the outlook was "very poor indeed." The U.S. market was of absolutely vital importance to the Scottish woollen industry, concluded Mr. Scott-Noble, and he hoped the Board of Trade would make every effort to influence the United States Government to change the present system. In his reply, Sir David said he felt the present U.S. Administration would make a real fight for freer trade. While he did not know how the present tariff inquiry would turn out, he was hopeful that things would be better. During the informal discussion which followed, Sir David dealt with various aspects of individual markets overseas, and with negotiations now going on over the proposed Free Trade area.

* * *

WORLD JUTE CONFERENCE

SPEAKING on his return from the international jute conference at Dacca, East Pakistan, Mr. W. G. N. Walker, on behalf of delegates from the Association of Jute Spinners and Manufacturers and the Jute Importers' Association of Dundee, said: "We are by no means dissatisfied with the results of our mission. We were cordially received by not only the President of Pakistan but also by the Governor of East Pakistan and certain Ministers of the Central and East Pakistan Governments. We met and got to know the leading members of the Civil Service, whose responsibilities were closely allied to our mutual problems. Mutual confidence has been established on a firmer basis than formerly and we hope that this will be the means of furthering the interests of jute in the years to come and increasing our customers' confidence in our products.

"The sale of raw jute earns for Pakistan approximately half of their foreign currency. The continued sale of raw jute in increasing quantities is therefore of vital importance to Pakistan's economy, and the closest attention was paid to representations made by the delegates from the U.K. Our general views," continued Mr. Walker, "were unanimously supported by delegates from all the other countries represented, and, in particular, by those who, like the U.K., use the bulk of their raw jute imports for the manufacture of specialised yarns and cloths, and not for packaging. Pakistan has many internal problems which it was our business, as customers, to study. Although her internal problems are no direct concern of ours, we appreciate her difficulties more clearly than we did before. We feel convinced that the Pakistan Government now appreciates our problems, and that, if steps are not taken by her to get over some of them, her sales of raw jute will decline, which, from her point of view, would be disastrous."

The conference, called by the Pakistan Jute Association, was attended by 50 delegates from 16 different countries.

Cleanliness in Textile Mills

Consideration of some of the factors directly affecting mill efficiencies such as cleaning and polishing warping reeds, warping swift cleaning schedule, attention to beam flanges and barrels, cleanliness in sizing techniques and machine operation, cut-marking, paper collars, etc.

By J. WHITE

WARPING reeds are important in warp cleanliness, particularly in warping mills where rayon bright or dull yarns are being processed. In the old type of vertical warping mill, the creel reed consists of four earthenware pegs or guides fitted in front of the leasing mechanism on the rising and falling heck. The pegs help to space out the yarn as it winds on the reel or swift, and also serve as porter-lease guides for the pin lease at the bottom of the run. These earthenware pegs always have to be kept clean for they collect lubricant and grease from the yarn and "fly" adheres to the grease, etc. The pegs should revolve freely, and in this condition the soilage potential is greatly reduced and static minimised. In many cases, however, the pegs are noisy when revolving, and since it is forbidden to oil them in case of soilage therefrom, many warpers jam the pegs so that they cannot revolve. This stops the noise but creates static and causes the pegs to be fouled by cotton wax, wool grease, etc., and regular cleaning is necessary.

One type of horizontal warping creel has a vertical steel plate, with small holes, fitted at the end of the creel nearest the swift. There is a hole in the plate for every bobbin in the creel, and the individual ends are threaded through the guide holes in regular bank order before being entered in the leasing reed. The holes in these plates require regular cleaning, especially when constant friction has cut slots in the holes, because some of the grease, wax and fibres are scraped off the yarn at the guide holes, and soilage occurs when light coloured yarns are subsequently processed.

Strong yarns like nylon, "Terylene," etc., whether spun yarns, monofilament, or multi-filament yarns are severe on such yarn guides where there is no freedom of movement, and they cut into the steel and make slots like clearer slots. This can be remedied by using vertical spacing reeds instead of the steel plate, and as the yarn is free to move laterally along the dent wires, grooving is negligible. Horizontal creel reeds are in use on Gothic type creels, and curved creels have spacing reeds curved to conform to the creel; this curvature minimises yarn friction at the dents, but it renders difficult the effective and methodical cleaning of the reeds.

Reed cleaning is easy on the silk-type warping creel which has wire combs at each creel bank and a long spacing reed. The wire combs can be wiped clean every week-end and, if necessary, detached singly from the creel while the long spacing reed can be completely dissembled dent by dent. After cleaning, the dents can be replaced, assembled dent by dent and secured by slipping the brass tube cap over each dent as it is fitted into the baulk. As the dent wires of this creel reed are circular in section they cannot be cleaned by the usual methods of pegging, pumicing, etc., but can be effectively cleaned by knife polish applied on sponge cloth.

An important adjunct to the spacing reed is the long glass rod fitted in adjustable brackets at the reed so that the warp ends can ride on top of the glass rod and can be set at any required height on the reed wires. The glass rod is important because it can be moved periodically to prevent the reed wires being cut by localised friction; it also helps to minimise warp-end tension on the reed. The glass rod—a potential collector of dirt—should be thoroughly cleaned every time a warp is creeled. If soilage is allowed to build up on it, dust and grit may rise to the running surface of the rod and will soil and abrade the yarn as it passes over the rod. The rod should be taken out periodically and washed in hot water and soap or with a paraffin and soap emulsion. The cleaned rod must be completely dry before refitting at the reed, or the dent wires will rust.

Leasing Reeds

Warping reeds with lease stops—illustrated in Fig. 26—become quite dirty with use and may rust if unused for long periods in a humid workroom. In the deep swing leasing-reed which is tilted from the horizontal until the warping section is the required width, some fibres are scraped from the warp yarn, especially when running with the reed at an acute angle to make a narrow section. The warper usually makes the lease by pressing the yarn sheet against the lease stops with his bare arm. In this type of warping it is essential that the warper's arms and hands are clean, and it is also necessary to clear the accumulated "fly" from the reed.

Leasing reeds on the modern sectional warping machines are fitted horizontally in a headstock which traverses laterally as required, and the lease is struck with metal rods, suitably manipulated. When the lease is taken, two hinged brackets, one at the top and one at the bottom of the reed, are swung into position; these brackets have glass rods at their extremities and ensure that the warp

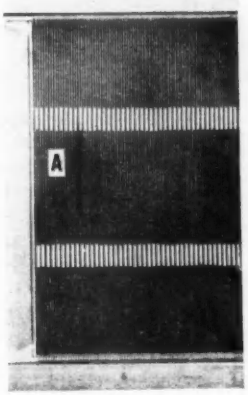

Fig. 26. Leasing reed before cleaning. A—rust area

sheet runs between two glass rods in a limited space at the leasing reed. The glass rods should be cleaned every morning and the hinges of the brackets made of brass and never oiled.

The short leasing rods are generally steel because the running yarn would cut grooves in wooden rods, and it is important to ensure the rods are perfectly clean or warp yarn will be soiled. The warper's hands must be clean or she will soil the lease rods, and the rod brackets or housings should be wiped clean every morning. If the housings are dirty this will soil the lease-rod ends, and as the warper grasps the rods at the extremities her hands will be soiled, and this will soil the warp sheet. The lease banding must be perfectly clean and the ends of the lease band not allowed to trail on the floor. This is important because as the mill revolves, the centrifugal action forces the trailing lease-band outwards where it collects all the dust and dirt it contacts. To avoid this the end of the lease bands can be tucked under a leaf-spring clip suitably fitted on the swift.

Lease-reed Cleaning

The leasing reeds require cleaning periodically, and if dull rayon yarn is being processed cleaning should be at least every fortnight. In many cases, only part of the reed width is used, and when a warp which requires the whole reed width is to be made, it is necessary to clean the reed because the dirty unused dents will require pegging. It is contended by some that cleaning warping lease-reeds is unnecessary because:—

(1) The running warp yarn will clean the reed in a few yards of the first section of the warp.

(2) If the lease stops are dirty and soil the yarn, this is not important because the soilage will be at the leases which are at either end of the warp.

(3) It is difficult to clean a leasing-reed in the headstock.

In practice it is found that:—

(1) A soiled reed will soil yarn in the first section for several hundred yards, and may soil ends intermittently if some ends rub against parts of the dents which have not been worn clean.

(2) If the lease stops are dirty, "fly" from the top bank of lease stops may fall into the warp sheet as it is running; in any case soiled ends at the leases will soil the succeeding layers of yarn which are wound over the leases on the swift.

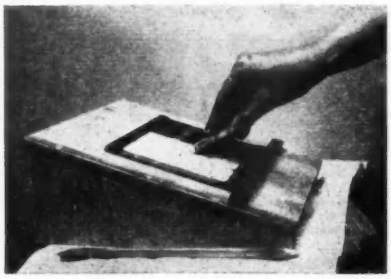

Fig. 27. Pumicing a lease reed

(3) The reed can be cleaned at the headstock, but a much better job can be done by cleaning the reed at the bench, and re-sleying the reed after cleaning.

Part of a fine lease-reed (30 dents/in.) is shown at Fig. 26. The side dents are not normally used and when it was required to use the whole reed width, a rust area affecting four dents was observed at A. The reed was removed from the headstock and placed on the small bench shown at Fig. 27. Reed cleaning was done with a pumice stone cake, shown at B, Fig. 28, which is held in the right hand. Pressure is applied to the stone with the index finger, and the stone is pushed to and from the opposite reed baulks until the surface of the reed wire is bright and clean, as shown at Fig. 27; the dark part of the reed is uncleaned while the bright part has been pumiced.

The pumice stone should bite into the reed dents, and the dents cut ribs or slots in the pumice stone, as shown at B, Fig. 28. As the pumice cake is $2\frac{1}{2}$ ins. wide only, the pumicing must be done in sections of $2\frac{1}{2}$ ins. across the reed on both sides. The pumice stone will ride over the lease stops during the pumicing operation, and it may be necessary to concentrate on certain parts of the reed. The rusty dents at A, Fig. 26 were specially rubbed on both sides of the reed surface, and the space between these dents was rubbed with very fine emery cloth to remove the rust inside the dents.

The part finished reed is shown at Fig. 28, and it will be observed that the rust is completely removed. The reed wire is worn a little thin at the repaired place, but although this would be bad in a weaving reed, it is harmless in a warping reed if the dent wires are sufficiently smooth. The dark part of the reed at the right-hand side had not been pumiced, and illustrates the benefit of pumicing. If the warping reed is required for fine filament yarns it will be necessary to generally smooth down all the reed dents after pumicing, by using a fine oil stone or a fine carborundum block.

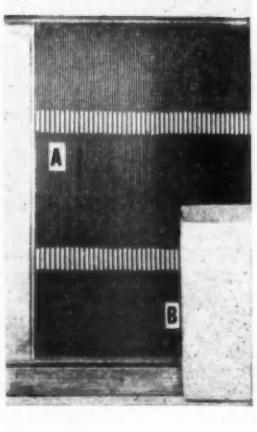

Fig. 28. Leasing reed after part cleaning. B—pumice cake

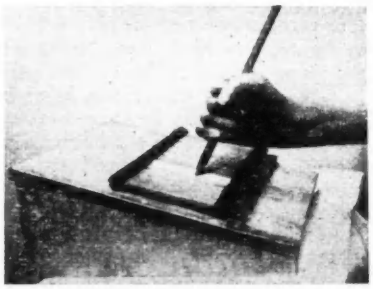

Fig. 29. Pegging a spacing reed

The job can also be done by rubbing the dents with knife polish rubbed vigorously on the dents with a soft cloth moistened with thin oil.

After pumicing and polishing it is necessary to clean out the pumice dust, knife polish, and residual dirt from the wires, and this is done by "pegging the reed" with a piece of soft wood, about $\frac{3}{16}$ in. by 1 in. wide and any convenient length. The stick is tapered to a point with a sharp knife and is placed on the reed as shown at Fig. 29. Pressure is applied to make the stick bite into the reed wires and it is then pushed vigorously from baulk to baulk. The object is to scrape the dirt from the inner surfaces of the reed wires, and this is done very effectively as shown by the example at Fig. 30. This dirt was collected over a small section of the leasing reed.

Pegging is continued inch by inch until the whole reed is cleaned on one side, and then the reed is reversed to peg the other side in a similar manner. The reed shown at Fig. 29 is a warping spacing reed. Leasing-reeds are pegged in a similar manner, but the pegging is done in three stages on each

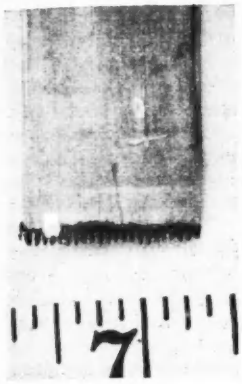

Fig. 30.
Peg stick after use

side of the reed (a) from the top baulk to the top lease stops (b) from top lease stops to the bottom lease stops and (c) from the bottom lease stops to the bottom baulk. The reed is finally finished off by brushing the baulks with a stiff brush to remove dirt pushed there by the peg stick. Rotary brushes are used in large mills where the cost is justified.

Spacing Reeds

These reeds are used to give the exact section width repeat required for the dress width of the warp, and are fitted on the front of the headstock nearest the warping swift or mill. These reeds require regular cleaning, and this can be done by pumicing and pegging as described for the leasing-reeds. The reed being pegged at Fig. 29 is a spacing reed, and the bright strip in the illustration shows the section that has been cleaned. When static-prone yarns are being processed, static attraction may cause dust to settle on the reed wires, and they should be cleaned with a cloth every day.

From the spacing reed the warp sheet passes to a small roller before going on to the warping mill or swift, and this roller must be kept clean at all times. For ordinary work the roller may be metal or brass-covered, generally highly polished with use. The roller bearings are sparingly greased to avoid yarn splash marks, and green labour should be told not to lubricate these bearings with thin spindle oil. It is suggested that the spacing-roller bearings should be the self-oiling bronze bearing type or should be run in ball bearings which only require infrequent greasing. As the roller diameter is small, it runs at a very high speed, and dirty oil, etc., will splash on to the warp sheet by centrifugal force if precautions are not taken.

When warping static-prone yarns, the roller in front of the spacing reed is sometimes covered with flannel and is immersed in a shallow trough of anti-static lubricant or water. The flannel covering is a potential source of warp soilage because it soon becomes dirty especially if a trough hood is not fitted. As atmospheric dust falls into the liquid in the trough and contaminates the yarn, it is necessary to clean out the trough regularly, and to recover the roller with clean flannel. This trouble can be avoided by fitting special anti-static units which render lubrication of the yarn by roller and trough unnecessary.

Warping-Swift Cleanliness

The cleanliness of the cross members of the warping mill or swift is very important because the yarn sheet is wound on the swift under great pressure. If there are oil spots on the cross bars this will soil several layers of the warp sheet, while dusty bars will soil the first few yards of the entire warp width. It should be a matter of strict routine to clean the warping swift immediately before running on the first section of every warp; the centre shaft and struts should also be cleaned, because dust and dirt can fall on to the warp from these parts of the mill while it is running.

This trouble is avoided by totally enclosing the inner circumference of some high-speed warping swifts with a metal or tin cylinder. This makes the warping mill look like a large can covered with horizontal bars, but it reduces soilage from the struts and the centre shaft, and also reduces the draught from fast running mills. The surface of the cylinder must be cleaned before running on a warp, but this is much simpler and cleaner than cleaning the inner struts and centre shaft of the unenclosed swift.

It is general practice to strip partly spent bobbins by running them off on an empty mill, and some warpers try to improve their efficiency by stripping some bobbins while they are actually warping. The yarn to be stripped is usually run off on an unused portion of the mill, in most cases at the extreme off-side. Trouble is experienced with this method of stripping when the bobbins run out and the loose ends fly round the swift. These ends sometimes drag on the floor and collect dirt which is carried round the swift and may soil the ends of the proper warp. In addition it soils the waste yarn and may reduce its commercial value. In other cases, one side of the mill may have been used to strip the bobbins from the last creel of yarn, and sometimes this waste is left on the swift while the new warp is being run on. Loose ends from this waste yarn may also foul dust on the floor and so soil the warp proper. In all instances, it is suggested that waste of any sort should be cut off the mill before warping commences.

Personal cleanliness of the operative is an important factor in warp preparation and every effort should be made to inculcate habitual cleanliness. Wearing white overalls is conducive to operative cleanliness, and waste yarn, etc., which might otherwise be thrown on to the floor can be deposited in the fitted pockets. Overalls should be cleaned every week and some cleaning firms have arrangements with employers whereby industrial overalls are provided, cleaned, repaired, and replaced, if necessary, by the cleaners. A continuous service is maintained by vans which collect soiled garments from the mills, and deliver clean ones each week. Each worker has three overalls, and the service cost of 2s. for a coloured overall or 2s. 3d. for a white overall can be deducted, by agreement, from the operative's wage packet or can be paid by the employer. Part of the cost, either to the worker or the employer, can be reclaimed in income tax relief. The constant wearing of clean white or light-coloured overalls has a psychological effect on the workers, who tend to keep their hands clean and so keep the warp yarn clean.

The headstock must be clean, because if the warper soils her hands on the headstock every time she moves it to the next section, soiled warp yarn will result. If the headstock is moved laterally on a screwed shaft, the latter should be covered with a shield in the headstock area, and the screwed shaft should be lubricated sparingly with special non-drip oil.

Beaming Off

Before the warp is beamed-off from the warping mill to the warper's beam, the empty beam should be inspected for cleanliness, particularly at the flanges and the beam barrel.

Flanges.—The inside surface of the flanges should be running true, set at the correct dress width, and thoroughly clean. In addition to faulty building at the selvedge, an untrue flange will scrape and soil the selvedge ends intermittently. Setting at the correct dress width is important because (a) if the setting is too narrow the selvedge ends will be soiled at the flange sides (b) if incorrect, the flanges have to be adjusted during the beaming-off process, and this may soil the warp yarn,

particularly if the flanges have to be adjusted with a hammer, and (c) the beamer's hands may be soiled when adjusting the flanges, and will soil the inside of the flanges, and subsequently any warp yarn he may touch. The inner face of the flanges must be clean or the selvedges will be soiled when unrolling from the beam at the sizing stage.

Beam Barrel.—The barrel should be clean, and the beam-stick, if any, free from all waste yarn, etc. Old wooden beams are difficult to keep clean, because the barrel becomes soiled with long usage and cannot be cleaned effectively unless about $\frac{1}{8}$ in. of wood is skimmed off in a lathe. Alloy or aluminium beams may soil the beamer's hands, and the slots into which the yarn is fitted at the start-up may soil the beamer's hands if the slots are not cleaned regularly.

Beam Bracket Fittings.—If the empty beam is fitted into the beaming-off brackets by hand, the beam is usually lifted by two men, and if they grasp the pikes, generally wet with black oil, their soiled hands will soil anything they touch subsequently, viz., the beam flanges, the ruffles, or the beaming handle. To avoid this it is suggested that (a) the beam gudgeon pins or pikes should be cleaned every time they come into the warping room (b) the beam should be lifted by special strong tubes fitted over the beam pikes or (c) the soiled pikes should be covered with cloth or stiff paper before they are grasped for lifting.

Modern equipment, such as electric lifting gear, avoids soilage from handling the pikes, but the chain slings should be cleaned regularly to avoid hand soilage. When manually-operated block and tackle lifting gear requires to be manipulated by pulling on a chain, the latter is a potential source of hand soilage. particularly if the chain is too long and drags on the floor. Either rust or dirt from the floor settle on the chain, and the operative's hands are soiled after pulling on the chain. To avoid this stout leather gloves should be provided for operating the chain if it is not possible to fit an electric elevator.

When the warp is completely beamed-off the swift the beamed warp should be placed on a clean truck and taken direct to the beam racks in the sizing room. If the yarn is bleached cotton or dull rayon, both of which are ultra-susceptible to soilage, the beam should be covered with clean paper before it is taken away from the warping mill. In many cases beamed warps are left lying on the floor for indefinite periods and become soiled by people pushing them out of the way or by simple contact with soiled overalls, etc. Flanged beams should never be pulled longitudinally across the floor, because this jars and may displace the flanges and scrapes dirt from the floor on to the flanges.

Cleanliness in Sizing

In most cases the beam from warping is sized and then wound on to a weaver's beam before being sent to the entering room or weaving shed but this does not obtain in warps made from hard yarns or folded yarns which weave without sizing. Quite recently a new type of warping swift has been introduced which enables the completed warp and swift to be taken from the warping machine and transported bodily to the sizing machine. The warp is run-off the warping swift direct on to the sizing machine, thus eliminating one beaming operation and so reducing the possibility of soilage.

Sizing Machine Brackets.—The brackets for supporting the warper's beam at the intake end of the sizing machine are a potential source of soilage, especially if the pike sockets are lubricated too freely and black oil runs down the bracket frame. It is necessary to lubricate the beam pikes, but it is suggested that the pike sockets should be cleaned for every warp, and that the pikes of each beam are lightly smeared with clean grease before running the set. If the grease is applied with a brush, the sizer's hands will not be soiled. This method ensures that the brackets are kept clean, that the beam pikes are adequately lubricated, and that the beam pikes can be easily cleaned when the empty beam is removed from the brackets.

The beam ruffles should be cleaned before the braking shoes or straps which tension the warp are fitted. If the braking strap is of new leather it may exude globules of oil when it becomes hot with the braking friction, and this oil should be wiped off the strap regularly until the latter has seasoned to the work. On no account should oil be applied to the ruffle surface in order to reduce the warp tension, nor should resin be applied to the ruffle to increase the warp tension. The former will soil the strap permanently, and the latter will powder and fall to the floor, in addition to making the ruffle sticky for future use and will soil the hands of anyone who touches the ruffle. Tension should be regulated by weighting or by brake-shoe screws.

Size and Size Troughs

The size ingredients should be clean and be baked in clean pans. The paddle mixers and pan should be washed out each night, and the pan covered to prevent dust particles or roof dirt falling into the pan. Domestic flour or sago or starch, rejected for human consumption on account of soilage from floors, bags, etc., is frequently used for warp sizing and should be put through a fine sieve before or after cooking in order to remove particles of dirt. If the latter are hard, and the size is not sieved, the particles will be sized on to the warp threads, and will cause excessive friction in weaving.

The trouble is also experienced if gelatine or special size compounds are contaminated with gritty particles. The latter may abrade filament rayon yarn when weaving, and may cut holes in fine fabrics when the woven fabric is being taken-up on emery-covered rollers. It is good policy to sieve all types of size before it is poured into the size trough. The size trough at the slasher must be perfectly cleaned each night, and the empty trough should be covered with a dust sheet to avoid dust soilage. It is said that a good sizer cleans and polishes his size trough as lovingly and efficiently as a good housewife cleans and polishes her jellypan, and such cleanliness should be encouraged.

The vessel used for transporting the baked size from the cooker to the sizing machine should also be clean, and should be covered with a lid. The vessel should not be too full or size will be spilled on the floor, and suitable arrangements should be made for safe, clean, and non-dripping transfer of the size from the vessel to the size trough. Size is often allowed to drip on floors, drip down the machine frame, and spill over the size trough. If such spillage is cleaned up on each occasion, the soilage may be negligible, but it frequently happens that the spillage is unheeded and is allowed to harden on the sides of the frame, the vessel sides, and outside the size trough. If repeated spillages of size are allowed to harden on the top of each other, a glutinous mass is formed which gives an impression of uncleanliness and has a bad pyschological effect on the workers.

The size rollers are usually covered with flannel which is renewed at the sizer's discretion. The rollers are heavy, and the flannel may be fitted in roll form or in the form of a sheath. In either case it takes time and much trouble to recover a roller, and this

tends to make some sizers run with rollers which obviously should be replaced on account of soilage. Where possible, spare rollers should be covered with new flannel, and kept in readiness for fitting into the sizing machine at definite intervals. This enables the machine to be run while the soiled rollers are being cleaned and recovered with flannel.

Care should be taken that the lubricant at the size-roller bearings is not allowed to touch the flannel. If the latter is soiled at the edges, the dirty oil may spread to the part of the flannel immersed in the size trough and the size will be contaminated. A cowl or hood covering should be placed over the size rollers and the size trough to prevent dust contamination. This covering should not be struck with anything accidentally, or some accumulated dust on the cowl may fall on to the warp sheet. This precaution should also be taken if a fluorescent tube is fitted over the warp sheet. If the lamp cover or the size-trough cover are not dusted every week, the dust will accumulate and will fall on the warp sheet if the lamp unit or trough cover are accidentally knocked.

Sizing Machine Cylinders

When the wet sized-sheet of yarn leaves the size rollers it passes to the large drying cylinder or to a battery of smaller drying cylinders. In the former, the wet sheet has to go under a guide roller before passing upwards to the large cylinder, and as the guide roller is always wet with size from the yarn, it must be kept clean and free from dust or "fly." The large cylinder too must be perfectly clean, and if the roof is not dustproof the cylinder should be covered with a dustproof hood. preferably made with timber.

Size should not be allowed to cake on the drying cylinder, and this is regulated by the squeeze rollers at the size trough and the temperature of the drying cylinder. The cylinder should be cleaned every night and particular attention should be paid to rust marks. Condensation above the drying cylinder causes moisture to drip from the roof or from metal hoods, and if these drips are allowed to form rust spots on the surface of the cylinder, the warp yarn may be soiled. The gland packing of the cylinder may develop a leak during a run, and as the warp would be over-baked if the machine was stopped for a gland-packing repair, small leaks are allowed to blow until the warp is run off. Such leaks should be repaired as soon as possible, because drips of hot water and oil will develop.

A five or seven set of small drying cylinders presents a larger area which may be soiled by roof dust, etc., unless a large covering is fitted. It is important to keep the warp sheet free from soilage from dirty oil, because one soiled grease spot may soil all the cans —and consequently the warp—for many yards. Although it is difficult to clean a set of seven drying cylinders, this should be done each week end. If the warps have been run through too quickly, or if the can t mperature has fallen below standard, the surface of the cylinders may be soiled by hard size. If some of the cylinders are covered with fabric the cloth may be renewed periodically, but if the cylinders are run bare, the hard size may be removed from the cold cylinders by the use of cloths soaked in hot water.

The cut-marking apparatus is a potential source of warp soilage, because it is frequently overlooked. The tint reservoir is generally open, and can be soiled by overhead dust, while the hammer pad can become soiled with continual use. If the cut-marker gears are oiled too liberally, the black oil may travel along the mechanism and soil the hammer pad. It is suggested that the reservoir is cleaned out each week, also the hammer pad cleaned or re-covered each week, and the whole apparatus is covered with a dustproof hood.

The splitting rods inserted in the warp sheet of rayon after it leaves the last can and just before it is wound on to the weaver's beam, must be clean and well secured. The rods are generally of steel in order to minimise frictional grooving, and some static sparking may be detected at these rods if static-prone yarns are being processed. Static electricity attracts dust, and the splitting rods should be thoroughly cleaned before insertion in every warp. The rods should be placed in convenient brackets when they are not in use, and should never be placed on the floor or on a dirty machine frame.

Hydrophobic yarns which do not "take" size well, sometimes give trouble at the splitting rods. If an unsuitable size is not sufficiently glued to the yarn, the size may powder off when the individual ends are split and rub against each other at the splitting rods. The size powder gathers at the rods and falls on the floor, where its sticky nature makes it difficult to clean-up if it contacts moisture. Where this trouble is observed, a large sheet of paper should be placed on the floor directly under the splitting rods to catch the size powder and make its subsequent removal simple and effective.

A back-beam set is generally run without leases, and the dress width adjusted by the expanding reed fitted in front of the weaver's beam. These expanding reeds are robust and should be cleaned of size sediment, etc., at the finish of every set. The pins may be cleaned with a soft rag or a soft brush, but slightly rusty pins should be rubbed with a soft rag moistened with thin oil, and then dipped into fine knife polish. When the rust is removed, the knife polish and dirt should be rubbed off and the pins then be rubbed with a clean cloth moistened with thin oil. The flanges, ruffles, and barrel of the weaver's beam should be cleaned before fitting in the beam brackets of the sizing machine, particular attention being paid to the barrel and the flanges. Wooden beam barrels are prone to splintering and soilage with long use; a general precaution is to fit a sheet of thick soft paper round the first layers of warp yarn on the beam. The beam stick should be clear of waste and soilage, or the beamer's hands and the warp may be soiled. Flange rims are a potential source of soilage, especially if the beams are rolled about a greasy floor and they should be cleaned before beaming. Any roughness on the flange rim or on the sides of the flange should be smoothed down, especially if filament rayon yarn is to be beamed. The beamer's hands should be clean, or the inner sides of the flanges may be soiled, and this will soil the yarn as it comes off the beam in weaving. Metal beams have their own soilage problems. If the flange is screwed on the metal or steel barrel, stiff screw threads must not be lubricated, or the oil will travel along the thread and soil the warp yarn. It is a good plan to paint the barrel and inner flanges of dark-coloured metal beams a white or cream colour; this makes soiled places obvious and induces the operative to wipe off the soilage.

Papered Warps and Paper Collars

Special warps are frequently beamed on flangeless beams, and paper sheets are inserted at approximately 10 yd. intervals to facilitate good beaming. The paper sheets are a potential source of warp soilage, particularly if warp papers are salvaged from the weaving shed for re-use in sizing. Such papers may be soiled with tappet grease, loom oil, etc., and should be inspected very carefully before re-use in sizing. As

the sizer inserts the papers by hand while the weaver's beam is revolving at normal sizing speed, he has not the time nor opportunity to inspect every paper sheet before he slips it under the warp sheet. The sizer's hands must also be clean or he will soil every paper he puts on the beam.

Flanged warps frequently require stiff paper collars at the sides, and these are generally used several times before scrapping. The weaving shed should return the collars in good condition, but the collars should be individually inspected in the sizing room before being passed to the sizer for insertion in a warp. Sometimes the collars are not inspected, and the corrugated paper collar shown at Fig. 31, and enlarged at Fig. 32, was actually put in a warp in the condition shown. The warp was soiled for several linear yards at the selvedge. Corrugated paper collars are preferable for beaming purposes, but the corrugations collect more dirt than the flat paper collars. The flat cardboard and paper collar shown at Fig. 33 was also taken from a warp in the condition shown; this paper had obviously been re-used more than once. A black grease spot on the paper spread, and damaged several yards of the warp. These paper collars are subjected to great warp pressure, and a small grease spot may be pressed out to a spot ½ in. dia. Polythene and plastic film collars are also used on weaver's beams, but these are generally cut from a clean new roll and give no soilage trouble. The plastic strips are not re-used on account of difficulties of bundling, etc.

The sizer frequently strokes the warp sheet, just before it is rolled on to the weaver's beam, to feel if the sheet is dry, and if his hands are soiled by touching soiled beam pikes, ruffles, or flange rims, the yarn will be soiled whenever he touches it. The importance of clean hands in textile processing cannot be overstressed, and if a sizer soils his hands with monorail equipment, sling chains, or by manhandling warp beams, etc., he should wash his hands before touching the warp yarn. Many sizers wear aprons, and these should be cleaned regularly, because soiled aprons or overalls can soil the warp yarn on the weaver's beam if the sizer presses against the beam when stretching over to the splitting rods or the cut marker.

Fig. 31. Soiled corrugated paper collar

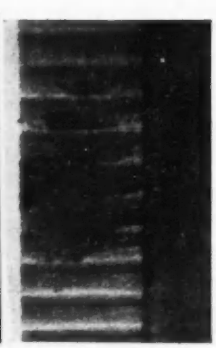

Fig. 32. Enlargement of dirty mark on Fig. 31

Static Electricity

If the warp sheet is split by lease rods before passing on to the weaver's beam, an appreciable amount of static is generated at the rods because, (a) the yarn is ultra-dry, (b) friction is created by the sized sheet splitting at the rods, and (c) the rods are generally of steel or tough metal in order to minimise grooving. When filament rayon warps are being sized, the static at the splitting rods can be heard and seen, and one can sustain a minor electric shock if the splitting rods are touched while the warp is running. The trouble can be minimised by earthing the lease rods to the machine frame, and static can be totally eliminated by fitting special static eliminators, but the cost of the latter may not be justified, because the yarn sheet is under control and cannot flare outwards unless the tension is released.

Fig. 33. Soiled paper collar

Static attracts dust, however, and if specially clean warps are required the machine should be cleaned before every warp is started.

After sizing, the warp should be wrapped immediately with clean paper, because the latent static in the beamed warp will attract dust until the static charge leaks away; this may take several hours. In some cases the sized warp is enveloped in a polythene sheath in order to keep the warp clean and immune from water damage. When it is remembered that a warp may contain over £100 worth of yarn, it will be agreed that it is economically logical to wrap it up well for protection; a polythene envelope may cost less than 2s. per warp.

Design in British Furnishing Fabrics

The six fine cloths on the facing page are a small selection from the ranges manufactured by Chatterton Weaving Co. Ltd., a subsidiary of Turnbull and Stockdale Ltd., Rosebank Printworks, Ramsbottom, near Manchester. In fast colours, guaranteed by the makers, these fabrics command the immediate attention of discerning people.

(1) 248D. A beautiful and symmetrical two-colour jacquard design in crimson and gold which radiates excellent taste in colour selection and effect. The diamond arrangement, edged with a small leaf and a neat, small centre-piece, is 3½ ins. deep and 2½ ins. wide. The fabric has a subdued but distinctive finish, and is 50 ins. wide.

(2) 246A. A pronounced "basket-work" ground in white and oatmeal provides the ideal setting for this extremely attractive warp-way three-colour "broken-weave" striped design. The stripes—¼ in. wide—are arranged in the following order from selvedge to selvedge: bright red, emerald green and royal blue. A crisp, well-balanced cloth, constructed to give maximum service, it is 48 ins. wide.

(3) 223B. A striking jacquard cloth which goes a long way towards completely satisfying those who prefer traditional designs and those favouring contemporary constructions. It is a remarkable effect and one which will enhance any decorative scheme. The broad—1½ ins. warp-way—stripe in a blue/green shade, makes the neat linked design stand out in relief. Light fawn separates the stripes and it is a 50 ins. cloth.

(4) 219X. A contemporary design following simple lines and one pleasant from every aspect. Moss green and black in the warp are skillfully arranged to offer the best ground for bleached weft-way stripes. At intervals of 1¼ ins. the white is brought more to the surface to give a novel face effect; 48 ins. wide.

(5) 236E. A slate blue ground of a subdued lustre is the perfect setting for this two-colour jacquard figured cloth. The fine, linked effect in lustrous emerald green contains a smart "four-leaf" centre at 1¾ ins. intervals. The fabric is 50 ins. wide.

(6) 244B. A double-toned jacquard featuring a scholarly design in traditional style. Two shades of green are employed, the ground being a light green and the figured effect which takes on a golden/green tone in reflected light. It is a very pleasant cloth which appeals immediately to all interested in furnishings of distinction; 50 ins. wide.

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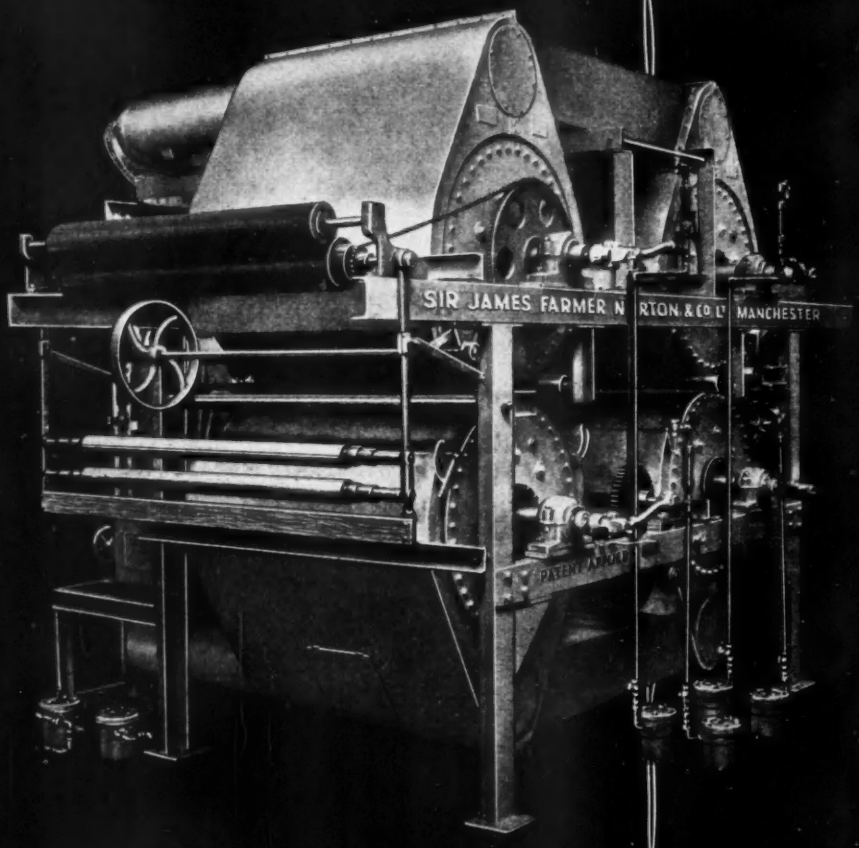
Quality & Design in British Furnishings



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Factors Which Influence Loom Design and Selection

Choice of loom is largely determined by the weight and structure of the cloth to be woven, the physical properties of the yarns used and the end purpose of the material

By S. A. G. CALDWELL, F.T.I.

WEAVING is the most expensive of all processes incidental to jute cloth manufacture, and as selling price is the main factor deciding demand—also susceptible to the ever increasing range of competitive materials in the main market for packaging materials—the need to ensure maximum economy in production in this as in other sections of the industry, is urgent. Labour charges constitute the major portion of weaving costs so that the problem of effecting economies in this department is concerned with increasing the output per operative by improved machine performance and by effecting the maximum degree of automatisation possible with due regard to capital outlay. As in other production departments, machine performance is determined to a considerable extent by the efficiency of preceding operations and the condition in which the material—in this case warp and weft—is received. Experience has shown that the advantages of modern high speed and automatic weaving equipment are largely lost unless the loom is supplied with suitably wound and uniformly tensioned warp beams and weft packages.

The design of loom for the production of any type of fabric is determined by the weight and structure of the cloth to be woven, the physical properties of the yarns used and the end purpose of the material. For their main purpose as packaging materials jute fabrics have a relatively short useful life. Frequently a single journey fulfils the purpose for which they are required by the user in the first instance. Made up into sacks the period of serviceability varies with the purpose for which they are required, as does also the fabric weight and structure. Additional to the merits of cheapness and assured supply are its resistance to wear and to distortion—due to its limited stretch—which makes it suitable for the production of relatively large packages. The permeability of jute fabrics to air is a further advantage in the conveyance of certain foodstuffs.

In recent years jute has become competitive in consumer markets formerly exclusive to hemp, linen and cotton materials, in the production of canvas, webbings, carpet and linoleum backing fabrics, tailors' linings and soft furnishings. This has necessarily involved the installation of looms suitable for the manufacture of these specialised products. While it seems likely that the prosperity of established European centres of manufacture will depend in increasing measure on specialised productions for which the accumulated technical knowledge and highly skilled labour force can be utilised to advantage, it is certain that attainment of maximum efficiency in production will continue to ensure for European manufacturers a considerable share of the world market for jute packaging materials.

Some Uses

The following range of fabric structures, while by no means comprehensive, is representative of the requirements from jute weaving plant—

Bagging—Used in the manufacture of various types of coarse bags. A heavy double warp, 6 to 10 lbs. per spyndle. Weft, 20 to 40 lbs. per spyndle. Sett 5 to 10 porter. 6 to 10 shots/in.

Buckram—Used as a stiff lining fabric in various trades. Warp 7 to 9 lbs. per spyndle. Weft 8 to 12 lbs. per spyndle. Sett 6 to 12 porter, one thread per split. Shotting 4 to 8 in.

Cotton Bagging—Used as covering for American cotton bales. Warp single, 8 to 12 lbs. per spyndle. Weft, single, heavy rove yarn 200 to 400 lbs. per spyndle. Sett 4 to 7 porter, with 2 to 5 shots/in.

Hessian (Fine)—Used for packaging, bag making, linoleum backing, furnishing fabrics. Warp 5 to 7 lbs. per spyndle. Weft 5 to 7 lbs. per spyndle. 14 to 18 porter. 16 to 20 shots/in.

Hessian (Ordinary)—Used principally for packaging and bag making. Warp, single, 8 to 10 lbs. per spyndle. Weft single, 8 to 10 lbs. per spyndle. 9 to 12 porter. 10 to 14 shots/in.

Scrim—Used for light open bags and wrappings, also as backing for tarred waterproof paper. Warp and weft single, 7 to 9 lbs. per spyndle. 5 to 7 porter. 6 to 8 shots/in.

Sacking—Used for heavy sacks and wrappings. Warp, double, 7 to 10 lbs. per spyndle yarn. Weft single, 20 to 36 lbs. per spyndle. 6 to 14 porter. 6 to 12 shots/in. Woven 2/1 twill.

Tarpauling—Used for wagon and other large covers. Warp double 6 to 12 lbs. per spyndle yarn. Weft single 8 to 16 lbs. per spyndle. 14 to 18 porter. 10 to 16 shots/in. Woven plain.

Wool Packs—Used as covering for raw wool bales. Warp double, 8 to 9 lbs. per spyndle yarn. Weft single, 30 to 48 lbs. per spyndle. 8 to 10 porter. 8 to 10 shots/in.

The fineness of reed, which determines the spacing of the warp threads in the loom and their proximity in the woven fabric, is calculated on the "porter" system. A porter contains 20 splits or dents of reed, and the unit reed base is 37 ins. One porter setting would represent 20 splits in 37 ins. A twelve porter setting would total $12 \times 20 = 240$ splits in 37 ins. of reed. Each dent or split may contain one or more warp threads, depending on structural requirements of the fabric. Hessians

are invariably drawn in two ends per split, while some forms of double warp and twill fabrics may be drawn in four, six, or even eight ends per split. The shotting, or proximity of weft threads is usually specified by the number per inch.

While the style of loom may vary to some extent with the type of cloth to be woven, jute looms used for the production of open width fabrics do not vary greatly in general design and mode of operation. They are invariably of the cone overpick type with negative shedding wypers. The warp let-off motion is negative, with a friction drag, the cloth take-up being positive. The reed is usually of the fast type a protector motion being fitted to prevent damage to the warp in the event of a shuttle becoming trapped in the shed, or failing to enter the box.

Table I gives the approximate block space and speed of open width looms of different reed space:—

Table 1

Type of Loom	Reed Space ins.	Floor Space Ft. ins.		Ft. ins.	Avge. Speed Picks/ min.
Sacking	32	7·3	×	5·9	160
„	37	7·8	×	5·9	155
Hessian	40	7·11	×	5·9	155
„	50	8·9	×	5·9	145
„	80	11·3	×	5·9	110

Due to its relatively low working efficiency weaving on the non-automatic loom is the most costly of the various operations incidental to jute manufacture. Early efforts to introduce the automatic loom in the industry were unsuccessful largely because manufacturers failed to appreciate the need for efficient warp and weft preparation. Also, jute yarns generally did not possess the reserve of quality necessary to ensure economic operation of automatic looms. Improvements in yarn manufacture in recent years, and in the machines used for this purpose, have increased the strength and regularity of the end product to an extent that ensures efficient performance on automatic broad looms, and on the modern types of circular loom.

Loom Developments

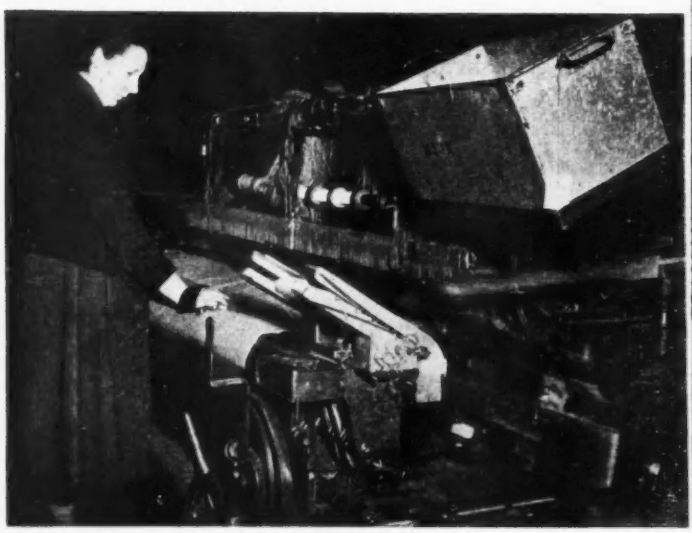
While the modern automatic loom contains certain refinements in addition to the mechanism for automatic replenishment of the weft supply, the principle of operation does not differ from that of its non-automatic predecessor. The setting of the warp line to ensure effective cover in the woven fabric, and to minimise strain on the warp in shedding and beating-up is essentially the same, as is also the timing of the sley movement in relation to shedding and picking, to ensure free passage of the shuttle.

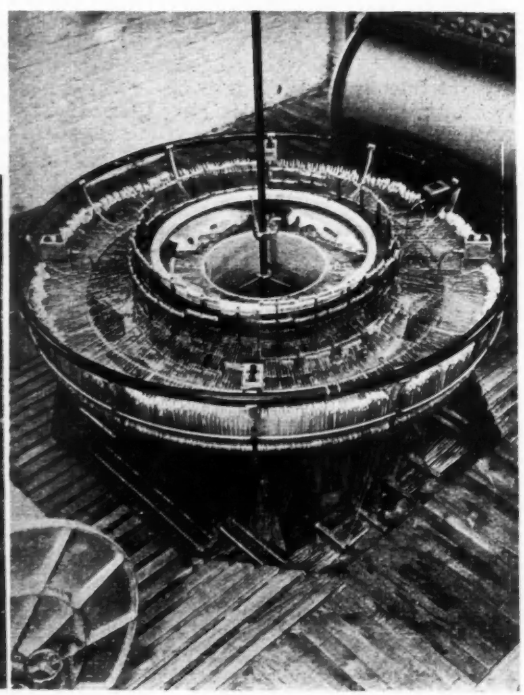
The Ruthardt loom, which was developed in Czechoslovakia prior to the second world war is claimed to be one of the most efficient non-automatic looms in the industry. With this economic performance is obtained through modification in design which permits a substantial increase in loom speed and the use of abnormally large weft packages. Smooth running at high speed is ensured by the introduction of a fly wheel and friction clutch, the latter preventing damage in the event of sudden stoppages caused by end breakage, etc. Picking is effected through the medium of a hardened steel roller running in a grooved picking cam designed to ensure maximum control of this operation. Elastic picking buffers are also fitted to absorb the unspent force of the picking lever. One feature of the loom is the ability to operate larger weft packages and shuttles with a shed no larger than that used on ordinary jute looms. This prevents undue strain on the warp in shedding.

The cop capacity ranges up to double that used on the ordinary loom, and the picking speed is approximately 25% greater. It is stated that in conjunction with the lower end breakage consequent on improved loom performance the amount of supervision is reduced to the extent that one weaver can tend twice the number of Ruthardt looms as ordinary ones. There are still a considerable number of non-automatic broad jute looms in operation, although many have, and are being displaced by new automatic

Fig. 1 (below). The "Ulro" shuttle loading mechanism holds 9 cops (Urquhart Lindsay and Robertson Ochar Ltd., Dundee)

Fig. 2 (right). The J2 model Saint Freres type loom (Fairbairn Lawson Combe Barbour Ltd., Leeds)





machines, and an increasing number of the old looms are being automatised by the addition of automatic weft replenishing mechanism, of which various types are now on the market.

Both pirn and shuttle change types of automatic loom are produced for jute weaving. The precision-built Northorp pirn changing loom magazine has a capacity for 17 pirns which ensures a considerable run without attention. It is built in sizes to weave fabrics from 24 to 125 ins. wide, and can accommodate warp beams up to 36 ins. dia., with cloth rolls up to 34 ins. dia. Using a special take-up device the capacity of the cloth roll can be increased to 52 ins. dia. The automatic mechanical stop motion provides for two, three or four rows of drop wires, including an additional device operated from the front of the loom to locate broken ends.

Individually driven looms require

1·0 h.p. up to 60 ins. wide.
1·5 h.p. 60 to 100 ins. wide.
2·0 h.p. 105 ins. and upwards.

The "Ulro" shuttle loading mechanism, made by Urquhart Lindsay Robertson Orchar Ltd., Dundee, shown in Fig. 1, can be readily fitted to existing as well as to new looms. The magazine holds 9 cops and is mounted at the non-driving end. The operating mechanism is enclosed in a housing which, with the cop feeler and weft fork unit, is fitted on the driving end gable, the setting-on handle passing through the housing. The cop feeler mechanism ensures that no cop is inserted while there is still weft in the shuttle. It works in conjunction with the weft fork unit to set the operating mechanism in motion when the shuttle is due for reloading. If the weft breaks the loom stops automatically. While existing non-automatic looms are in good mechanical condition and capable of further useful service this loading mechanism constitutes an economic and efficient means of making them automatic,

The Martin shuttle loader, which originated in Germany, has also been fitted to ordinary jute looms in many mills, to make them automatic in action. The shuttle in this case is of normal construction and utilises the standard tubular cop. The magazine is designed to take approximately 16 cops. Operation of the reloading mechanism is determined by the action of the feeler and weft stop-motions. The Martin loader is made in this country by James Mackie and Sons Ltd., Belfast.

Many years research and experiment have been devoted in the past to the perfection of efficient looms to weave tubular fabrics in heavy material suitable for the manufacture of sacks and bags, and the advantage claimed for modern types of these looms are as follows:—

(1) Saving of material through elimination of side seams and the need for sewing thread.
(2) Saving in direct labour cost. One operative can supervise up to four circular looms, which have an output capacity comparable with that of 10 to 12 broad looms, this being more than one operative could supervise of the latter.
(3) Improved quality of cloth due to smoother action of the mechanism, which reduces the strain on the yarn. Also, the higher degree of uniformity in warp tension and smoother shedding result in fewer warp breakages during weaving.
(4) Reduction in hairiness of cloth by elimination of friction of reed, as this is not used to beat up the weft.
(5) Working conditions in circular loom weaving sheds are better than those in broad loom units because of the absence of noise.
(6) The cost of maintenance of the circular loom is lower because of the absence of pickers, picking straps, etc.
(7) The output capacity of a circular loom is approximately 30 yds. of tubular fabric per hour.
(8) It is claimed that tubular sacks are stronger than those made from open width fabrics, being less liable to burst if dropped when full, or otherwise mishandled.

Circular Looms

Circular jute looms are capable of weaving a wide range of fabric weights, and are consequently suitable for the production of most types of sack in ordinary use. The loom mechanism and warp beams of the J2 model, Saint Freres type loom, shown in Fig. 2, is produced by Fairbairn Lawson Combe Barbour Ltd., Leeds, are mounted on a platform on which the operative also stands. The warp threads from the beam are drawn underneath the platform and pass into the loom from below. The woven fabric is also delivered below the loom. Different systems of cloth take-up can be fitted to suit subsequent requirements. The tubular fabric may be directed round guide rollers to a positively driven roll winder. Alternatively, it may be guided into an automatic folding mechanism.

Two standard models of the Saint Freres type circular loom are produced by Fairbairn Lawson Combe Barbour Ltd. The J2 plain motion loom weaves cloth from 98 to 148 cm. (38·6 to 58·4 ins.) tubular circum. It employs four shuttles, the maximum number of picks inserted per minute being 520. The weft cop dimensions are 79 × 300 mm. ($3\frac{1}{8} \times 11\frac{13}{16}$ ins.), and the weight 750 grammes ($26\frac{1}{2}$ ozs.). The warp on each loom is drawn from two warp beams mounted at opposite sides of the weaving mechanism. All the elements of the loom, excepting the stands for the beams, are mounted on a cast aluminium base plate. Driving is normally by individual electric motor.

The J3 twill motion loom has a similar fabric circumference range to the J2 unit. The maximum weaving speed is 460 picks/min., and on this machine three shuttles are used. The weft cop dimensions are 79 × 450 mm. ($3\frac{1}{8} \times 17\frac{3}{4}$ ins.), and the weight 1,100 grammes (39 ozs.) The driving arrangements are similar to those for the J2 model. These looms are extremely easy to operate. Electric stop motions are provided to function in the event of an end breaking or cop running out. The disposition of the warp is such that piecing up is easy.

The Fayolle circular loom for weaving jute and similar coarse fabrics differs in structural design from the Saint Freres machine. The warp is carried on two beams situated one on each side of the machine at floor level from which it passes up to the weaving mechanism. The ends are drawn in past a warp thread stop-motion and subsequently through back reeds set horizontally round the machine. Above these are located the comb shedding mechanisms which work horizontally. From these the warp is conveyed over a fixed circular comb, also mounted horizontally, on which the two shuttles work simultaneously. These are controlled by magnets which drive them through the shed. A sucker device, located in the centre of the machine draws the fluff into a bag container. The woven fabric is taken up on a roller placed above the machine. The Fayolle circular loom is fitted with warp and weft stop motions which are practically instantaneous in action. It can be adjusted to produce different widths of tubular fabric to suit the specific requirements of the bag trade. The normal range is from 60 cm. (23·6 ins.) to 72 cm. (28·4 ins.). The adjustment can be made quickly and easily when a change over is necessary.

Factors Affecting the Quality of Jute Yarns

An account of a series of processing experiments designed to examine the characteristics obtained from yarns spun under different conditions of doubling and drafting

By C. M. WATSON, A.T.I., C.G.I.A.*

IN the preparation and spinning of hessian type yarns from jute fibre, the carding process and the drafting and doubling process in drawing, is usually limited to the restricted variable factors available by the use of a breaker card, finisher card, first drawing frame, second drawing frame, third drawing frame and spinning; if spinning from sliver, and a first drawing frame, second drawing frame, roving frame and spinning, if spinning from rove yarn. This arrangement provides, consistant with production requirements, a very limited means of exploiting drafting and doubling, and as doubling, to an unknown extent, cancels out processing irregularities, it follows that drafting and doubling in drawing must have an optimum value in direct relationship to the degree of fibre breakage obtained in processing.

Doubling in spinning to be of commercial value must produce a yarn of significant improvement in quality therefore many factors have to be considered before this method of spinning may be adopted. The individual jute fibre is a compound arrangement of hinged on fibrils whose distribution and orientation in the finished yarn is influenced by many factors, natural and mechanical.

This article is an account of a series of processing experiments designed to examine the characteristics obtained from yarns spun under different conditions of doubling and drafting from rove yarn produced over a system with 1,024 doublings when compared with a control, comparable with modern practice, and using a total of 196 doublings, drawing to spinning.

The particular quality of fibre processed was selected as representing the top grade as used in jute yarn manufacture possessing good tensile properties of a regular character. The yarns spun being representative of good quality hessian warp.

Machine Details and Preparation of Fibre

The fibre selected was "white jute" (C/Capsularus, all being from one 400 lb. pucca bale, marked as indicated in Fig. 2.

The fibre on inspection proved to be mixed in length, of fairly regular colour and quality and possessing good lustre.

Carding factors of breaker card and finisher card were arranged to give the minimum of fibre breakage consistant with effective carding and cleaning of the fibre. A graph of the analysis of work done in carding is shown at Fig. 1. Of 100 lb. of fibre made up into 2 to 2½ lb. stricks, 70 lb. was rove spun and 30 lb. sliver spun. The fibre was passed over 32 pairs of a standard type jute softener, then hand batched

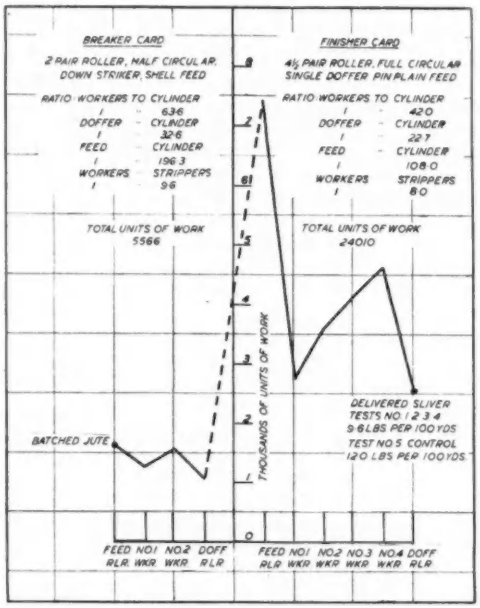

BREAKER CARD
2 PAIR ROLLER, HALF CIRCULAR DOWN STRIKER, SHELL FEED
RATIO WORKERS TO CYLINDER
1 - 636 - CYLINDER
DOFFER
1 - 326 - CYLINDER
FEED
1 - 196·3 - STRIPPERS
WORKERS
1 - 9·6
TOTAL UNITS OF WORK 5566
FINISHER CARD
4½ PAIR ROLLER, FULL CIRCULAR SINGLE DOFFER PIN PLAIN FEED
RATIO WORKERS TO CYLINDER
1 - 420 - CYLINDER
DOFFER
1 - 22·7 - CYLINDER
FEED
1 - 108·0 - STRIPPERS
WORKERS
1 - 8·0
TOTAL UNITS OF WORK 24010
THOUSANDS OF UNITS OF WORK
BATCHED JUTE
DELIVERED SLIVER TESTS NO. 1 2 3 4 9·6 LBS PER 100 YDS
TEST NO 5 CONTROL 12·0 LBS PER 100 YDS
FEED NO.1 NO.2 DOFF RLR WKR WKR RLR
FEED NO.1 NO.2 NO.3 NO.4 DOFF RLR WKR WKR WKR WKR RLR

Fig. 1. Analysis of work done in carding. Total units of work expended in converting conditioned fibre to sliver—29,576

Table No. 1. Tests No. 1, 2, 3 and 4

	Bkr. Card	Fin. Card	1st Drn.	2nd Drn.	3rd Drn.	4th Drn.	Roving Frame
Draft	12·6	10·2	3·8	5·0	6·0	6·0	8·0
Doublings ..	—	8	4	4	4	2	1
	cyl.	cyl.					
Pins/inch ..	1·5	2·6	2·7	4	8	8	11

Dollop; 24 lb. Clock Length; 15·5 yards. Rove Weight; 32 lb./Spyl.

Table No. 2. Test No. 5, Control

	Bkr. Card	Fin. Card	1st Drn.	2nd Drn.	Fin. Drn.	Sliver Spinning
Draft	12·6	10·2	6·0	7·0	8·0	14·0
Doublings ..	—	8	4	3	2	1
	cyl.	cyl.				
Pins/inch ..	1·5	2·6	4	8	7	—

Dollop; 30 lb. Clock Length; 15·5 yards. Yarn; 8·7 lb./Spyl.

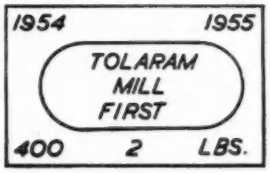
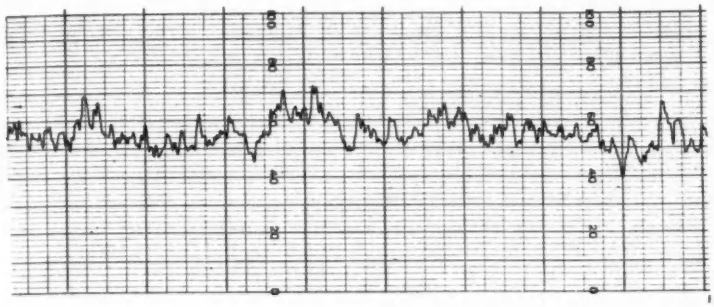
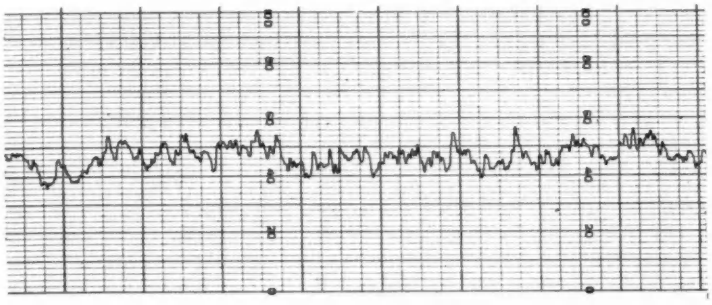


Fig. 2. Brown

* *Head of Textile Dept., Dundee Technical College.*



Test No. 1. 1 end into 1. 8·2 lbs./spyl. Q.F. 92·44%. C.V. Count 25·23%. C.V. Tensile 9·38%



Test No. 2. 2 ends into 1. 8·2 lbs./spyl. Q.F. 97·10%. C.V. Count 24·63%. C.V. Tensile 10·13%

with the following ingredients: mineral oil, 5%; emulsifier, 0·8%; water 22%. The fibre was allowed to condition for 72 hours, then passed over 32 pairs of rollers of a standard type jute softener to promote distribution of lubricant. Processing details and the machines are given in Tables 1 and 2.

Yarn Tests

Tests were taken from hanks reeled from random selection of ten bobbins. Average of 100 breaks, 10 from each bobbin. Prior to testing the yarn was conditioned for 24 hours at an R.H. of 65/70% at a temperature of 70°F., and then tested without removal from these conditions. The tests were carried out on a Goodbrand single-thread tester with a constant rate of traverse of 12 ins./min.; test length between bollards 24 ins.

The coefficient of variation of count was interpreted by Fielden levelness tester; 30-second checks from a random selection of bobbins. Twist determinations, average of 10 tests from each of 5 bobbins. A summary of the test results is given in Table 3.

Drawing Frames

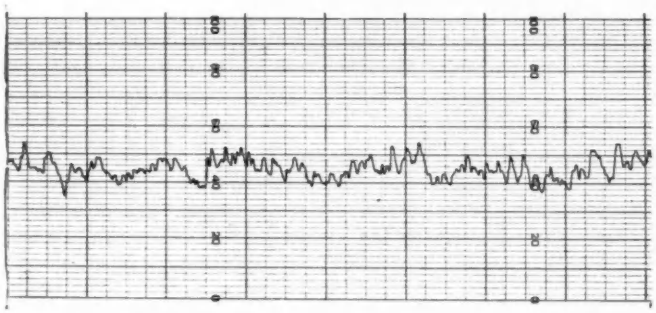
As efficiency and the production of a sliver of regular quality from the respective heads of drawing frames is closely allied to the correct settings incorporated in the various machines, gauges were made to ensure parallel reproduction of settings, retaining to drawing rollers, and faller bars to retaining and drawing rollers. Pin density, fluting of drawing rollers and pressure per linear inch exerted by the pressing rollers are also factors related to regularity of sliver. Leads, faller bars over retaining rollers and delivery over drawing rollers provide an element of uncontrolled drafting, and were therefore kept at a minimum.

Spinning

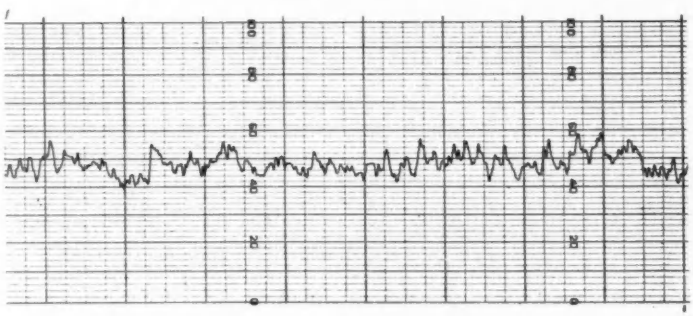
In spinning it is realised that any test made on a basis of a 12-spyndle spinning frame cannot be directly related to mill conditions where frames of 100 spyndles are used, but it is hoped the details given and the results recorded in this article will prove of value in demonstrating the degree of improvement that may be obtained from drafting and doubling in excess of modern mill practice. Modern mill practice as represented by the control test achieves two objects—(*a*) maximum production per unit of processing machinery and (*b*) minimum faller bar speed on finishing drawing frames with corresponding improved efficiency.

Conclusion

In reviewing Tests Nos. 1, 2, 3 and 4 significant differences only exist in (*a*) drafting and (*b*) quality factor. Other factors are comparable. From



Test No. 3. 3 ends into 1. 8·4 lbs./spyl. Q.F. 102·60%. C.V. Count 24·71%. C.V. Tensile 9·15%



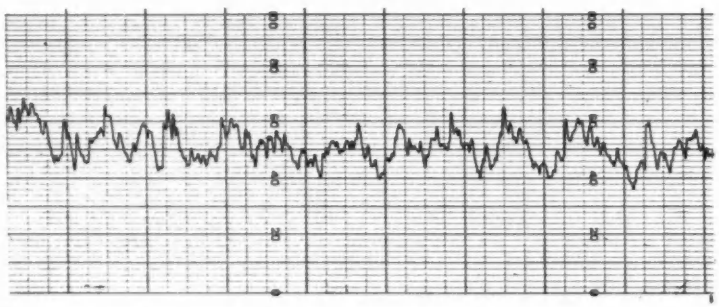
Test No. 4. 4 ends into 1. 8·05 lbs./spyl. Q.F. 109·31%. C.V. Count 25·0%. C.V. Tensile 9·43%

Table 3

	1	2	3	4	5
Count in lbs. per spyl. ..	8·2	8·2	8·4	8·05	8·7
Draft	4·0	8·0	11·8	15·6	14·0
Twist in t.p.i. (actual) ..	4·02	4·05	3·96	3·98	4·13
Twist factor, "K"	11·5	11·6	11·5	11·3	12·0
Mean strength of yarn ..	7·58	7·96	8·62	8·80	8·60
Range	2·6	2·9	3·0	3·3	3·5
Quality factor, %	92·44	97·10	102·60	109·31	98·74
Mean deviation	0·598	0·692	0·7002	0·713	0·7066
Per cent mean deviation ..	7·9	8·7	8·11	8·102	8·21
Variance	0·506	0·654	0·627	0·689	0·777
Standard deviation	0·711	0·807	0·789	0·830	0·881
Co-efficient var. tensile ..	9·38	10·13	9·154	9·432	10·24
Co-efficient var. count ..	25·23	24·63	24·71	24·99	28·09

Roving sliver .. .. 5·6 yds./lbs., co-efficient var. 6·4%, condenser No. 1.
Rove yarn .. .. 450 yds./lbs., co-efficient var. 14·9%, condenser No. 1.
8 lbs. per spyl. yarn .. 1,800 yds./lb., condenser No. 3.
Spinning sliver (control) 128 yds./lbs., co-efficient var. 13·5%, condenser No. 1.

Key :—
Test No. 1. Yarns spun from single rove yarn.
Test No. 2. Yarns spun from two rove yarns doubled into one.
Test No. 3. Yarns spun from three rove yarns doubled into one.
Test No. 4. Yarns spun from four rove yarns doubled into one.
Test No. 5. Yarns spun from sliver; (control).

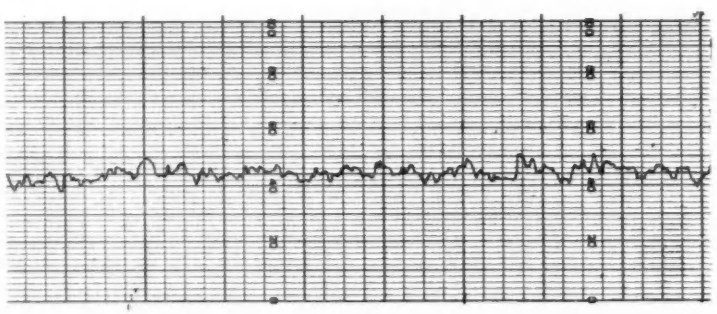


Test No. 5. Control. 8·7 lbs./spyl. Q.F. 98·73%. C.V. Count 28·09%. C.V. Tensile 10·24%

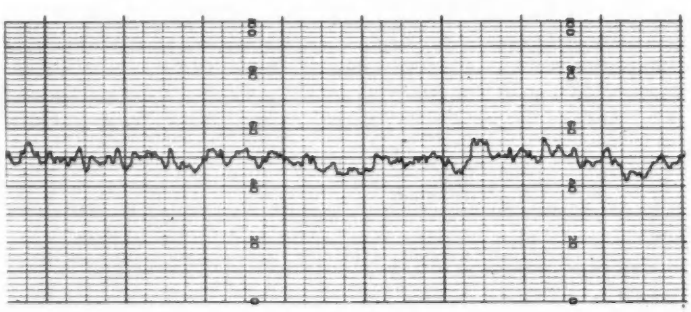
drafting and quality factor it is evident that a draft of 4·0 to a draft of 15·6 has had little effect on regularity of count of yarn and regularity of tensile strength. As the reach on the spinning frame is 10½ ins. it is evident from the analysis of C.V. of count that no fibres exist of that length, indicating that fibre breakage in carding, under the reduced carding conditions, is sufficient.

In drawing and doubling comparison of regularity of slivers processed for rove yarn and slivers processed for sliver spun yarns (control), viz.: roving sliver, C.V. 6·4%, rove yarn C.V. 14·9%, sliver for sliver spinning, C.V. 13·5%, indicates that there is an optimum degree of processing (drawing and doubling) suitable for slivers for jute yarns, and that 192 doublings as in the control test is sufficient. In spinning, Tests Nos. 1, 2, 3 and 4, fibre distribution in doubling and reorientation in drafting is indicated as a factor of some importance recorded by the progressive increase in Quality factor: viz. No. 1, 92·44%, No. 2, 97·10%, No. 3, 102·60%, No. 4, 109·3%, and this while the C.V. of count averaged 24·89%.

A significant difference exists in C.V. of count between Test No. 5 (control) 28·09% and average C.V. of count of rove spun yarns, 24·89%, as the C.V. of the sliver at the feed side of the sliver spinning frame is 13·5%, this is evidently a spinning frame problem worthy of investigation. In this respect it is suggested that spinning frame retaining rollers having 38 flutes are more efficient than those having 45 flutes due to their improved retaining properties, and greater control of fibre slippage in drafting.



Spinning Sliver Control. 128 yds./lb. C.V. Count 13·5%



Rove yarn. 450 yds./lb. C.V. Count 14·9%

Acknowledgment

This account represents, in part, investigational work on commercial problems undertaken by final year diploma students of Dundee Technical College Textile School. I also desire to acknowledge my appreciation to the governors of the college and to Dr. Whittaker for permission to publish the paper, and for the interest shown in processing research work undertaken by the school.

New Appointment

Mr. A. H. Wilson, F.R.S., a managing director, has been appointed an additional deputy chairman of Courtaulds Ltd. He retains his managing directorship and Mr. C. F. Kearton, O.B.E., has been appointed an additional managing director.

Silk Fabrics

Origins and descriptions, with the ends and picks, of chiffons, gauzes, bolting cloth, China crepe, levantine, ninon, voile, etc., fabrics

By W. MIDDLEBROOK*

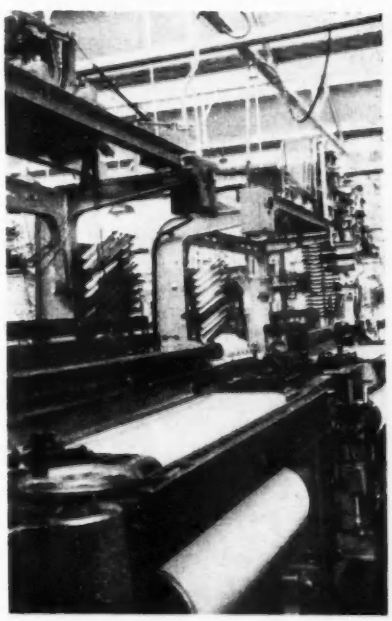
THERE is a well-known saying: "You cannot make a silk purse out of a sow's ear." When one considers that the French term for silk is *soie*, it seems evident that this old saw is really a play on words, like saying "One man's meat is another man's poison" when the actual word is poisson, meaning "fish." In fact, when the long-cherished secret of the silk worm had been wrested from China by the Japanese, spreading to India, Persia, Central Asia, the Levant, Italy and France, the thread was likened to the silken hairs of a hog or wild boar, the French name for these hairs being soie. Despite the tremendous displacement of real silk by man-made fibres in modern times, the fact remains that pure silk is still regarded by many as the aristocrat among yarns, and silk fabrics still hold a place of their own among those of taste and discernment when dress materials are being discussed. The Chinese held the secret of silk for hundreds of years, but the French finally obtained it and exploited the possibilities to the fullest extent; indeed, it was a Frenchman, Joseph Marie Jacquard, who put the finishing touches on the silk fabric by inventing a machine that could combine the artistry of design with the mechanics of weaving. The French influence is displayed in a most emphatic manner by the names of silken fabrics, most of which are French in origin.

One of the flimsiest of silk fabrics is *chiffon*, the name springing from the French *chiffe*, meaning a rag or flimsy cloth; the flimsiest of all *chiffons* is called *chiffonette*. These fabrics are used for boudoir caps, curtains, cushion covers, dress goods, fancy work and embroideries, handkerchiefs and scarves, women's hats, infant wear, lamp shades, linings, pyjamas, trimmings and ladies' underwear. *Mousseline de soie*, which really means "silk muslin," is another chiffon fabric, 44×40, 30 den. warp and weft; sometimes it is given a stiff finish and called *pineapple cloth*. The French term *mousseline* is applied to all fabrics that are finer than muslin, whether of silk, wool or cotton. *Mousseline matte* is an evening dress fabric of *grège* silk. Again, *grège* is a French term, meaning the raw silk as produced by the filatures. *Lisse* is a flimsy chiffon made with fine silk crepe yarns, used for veilings and light dresses; the name, from *lisson*, meaning supple or flexible, is also the French for a silk warp, meaning smooth, sleek or glossy. Another flimsy chiffon of similar character, made in the 18th and 19th centuries, went by the strange name of *love*.

An industrial fabric in the chiffon group is *insulation cloth*, one quality being 130×86 of 20/22 den. singles warp and weft; the fact that single warp threads are used instead of the more usual three- or four-threads means that drop wires can be used in conjunction with the warp stop motion. It is important that these fabrics should be flawless, with no broken picks or ends out, and without thick or thin places, as the cloth is impregnated with a special chemical solution for electrical insulation purposes.

A *gauze* fabric is open in texture, a thin, transparent material that the French call *gaze*, which is believed to have originated in Gaza, Palestine. For weaving gauze in a shaft loom an additional half shaft called a "doup" is needed, and a yarn-slackening arrangement whereby certain doup or crossing threads may be made to cross from one side to the other of standing or standard threads, each group of such threads being entered in the same reed dent. When figured gauze is made, a jacquard with a doup harness is used, making what are known as *leno* fabrics. Smooth, polished yarns such as silk, mercerised cotton and linen are most suited for making gauze fabrics.

Agra gauze is of fine silk, for trimmings. *Aerophane* is a solid colour silk gauze for dress and hat trimmings. *Bologna gauze* is for mourning or wedding veils, as also is *gossamer*, one quality being 80×40, 20 den. warp and 36 den. weft. The word *gossamer* is applied to thin spiders



Chiffon fabric in Ruti silk loom

* *Brocklehurst-Whiston Amalgamated Ltd.*

webs that float on the air, or festoon bushes with silken veils on fine mornings, and in this sense it means a thin, gauzy substance or fabric, but the *gossomer* of the Middle Ages referred to St. Martin's summer, early in November. Martinmas was called "*goose summer*," goose being a popular dish in those days when geese were plentiful; there is a legend to the effect that Saint Martin, Bishop of Tours, was betrayed by the cackling of geese when he was hiding from his enemies in a chimney. *Grenadine* is a light dress fabric with an open gauze weave or an ordinary plain weave, made with what is known as Grenadine twist, highly twisted yarns of silk organzine; the name is from the French *Grenade* (Granada), ancient Moorish capital in Andalusia.

Bolting cloth is a fine silk gauze for fine sifting, dress trimmings, wig foundations and stencils. Originally made of wool, then of linen, it was used for separating bran from flour, and for sifting meal. The name comes from *bolter*, meaning a sieve. The first silk sieving gauzes were made in Switzerland on handlooms, with gummed silk, a high humidity being essential to bind the gum layers of contacting yarns. *Bolting cloth* and *souple silk* are two of the few silk fabrics used in the gummed state. A typical *bolting cloth* has a four-thread warp with alternate pairs of leno or doup and plain-weaving ends, with 100 picks of 13/15 den. weft per inch, all the yarns having from 14 to 16 t.p.i. Another use for *bolting cloth* is as a screen for printing silk. The French term for both *bolting cloth* and *bunting* is *etamine*, possibly from the fact that the now obsolete *bunt* or *bonten* meant to *bolt* or sift meal. Where *bolting cloth* is still used for fine sifting, *bunting* is now used for flags and streamers, the best qualities being of worsted and nylon.

China crepe is a fine silk gauze of gummed silk, an imitation of an earlier fine worsted; another silk gauze is *Maline* or *Mechlin lace*. *Donna Maria* is used for nuns' veils. *Marquisette* is a plain silk gauze, used for theatrical and carnival costumes, curtains, draperies, dress materials, handkerchiefs, lamp shades, robes and wraps, screens and partitions, and trimmings. *Silk georgette* is really a very light crepe or crinkled fabric, with warp and weft of alternate "S" and "Z" twist, with from 80 to 100 ends and picks per inch. There is a high rate of twist on the yarn, and special care has to be taken when gaiting in the loom to ensure that the opposing twists do not get hopelessly entangled. Two warp beams are often used, one for each twist, and all warp yarn should be kept as tight as possible until finally tied up or gaited. *Georgine* is a finer quality of silk *georgette*, both fabrics being used chiefly as dress materials.

Levantine is of thin silk, used for sleeve linings. *Sarcenet* also is a lining fabric for millinery, as well as a sheer silk veiling, the name coming from the Arabian *saracens* or head dress. *Crystaline* is a loosely-woven dress fabric, while *ninon*, supposedly named after a famous French lady of the 17th century, is of 12 to 14 den. raw silk with the same twist way for both warp and weft. *Alamode*, a plain-weave silk for ladies' scarves, was introduced into England by French immigrants in 1685; the name is from the phrase *a la mode*, meaning "in the fashion," given to glossy black silk from Lyons. *Paillette de soie*, another fabric with an odd name is a silk cloth that is spangled with jet or gelatine. The word *paillette* means "a spangle," a small piece of coloured foil or metal in enamel painting; the Latin *palia* means "straw," and gives us the "palliase" or straw-filled bed, but it also means "a grain of gold," and it is in this sense that *paillette* is used.

Schappe voile is a plain silk voile made with schappe yarns, spun-silk yarn from waste silk that has been degummed by a process of fermentation called *schapping*; the finished yarn contains from 10% to 12% of natural gum. *Soie batiste* is really a silk cambric, a light, summer dress fabric that may be plain, coloured, or ornamented with tiny figures; the name *batiste* comes from a linen weaver called Jean Baptiste. *Voile*, from a word meaning veil or curtain, is made with warp and weft of the same twist and counts. One quality is 100×108, with 20/22 den. warp and weft with 65 turns to the inch. Temples are used to hold out the fabric, though care must be taken to ensure that the rubber temple rollers do not disturb or mark the cloth. Sufficient weight is needed to weave the cloth without bareness, and weight ropes should be in good condition to prevent "shady" work.

A thin silk gauze or *gaze de soie* has the same name as a cotton gauze muslin previously described; this is called tiffany, a corruption of epiphany, the material once being used as a dress worn on twelfth night. *Eponge* or "sponge" is a soft, loose fabric that may be of silk, wool, cotton or rayon; another soft fabric is the Japanese *habutai*, a lightweight material used for shirts and blouses. This is a washing silk, woven from raw silk filature yarn with little twist, and the name *habutai* means "soft as down."

Textile Institute Competitions

The T.I. competitions in 1958 for yarns and woven, knitted and printed fabrics, will be open to students of the whole world, no matter where resident, with the exception of one competition. In a letter sent to colleges in Australia, Belgium, India, Pakistan, Scandinavia and the U.S.A. the Institute points out that the entries for the various competitions should arrive at headquarters not later than April 30, 1958. The one competition not "open" to the world is the Crompton (Cotton Fabrics) which is reserved for "any British national or member of the British Commonwealth."

Empire Cotton

Mr. A. Draper, F.T.I., has been nominated representative of the Textile Institute on the administrative council of the Empire Cotton Growing Corporation.

Fancy Coatings and Suitings

Photographed full size for the purpose of detail, the six patterns on the facing page are a representative selection from the range of cloths manufactured by A. Laycock and Sons (1930) Ltd., woollen manufacturers, Tower Mills, Huddersfield. Brief details are as follows:—

(1) Ladies fancy novelty coating in black and white—20 ozs. per yd.

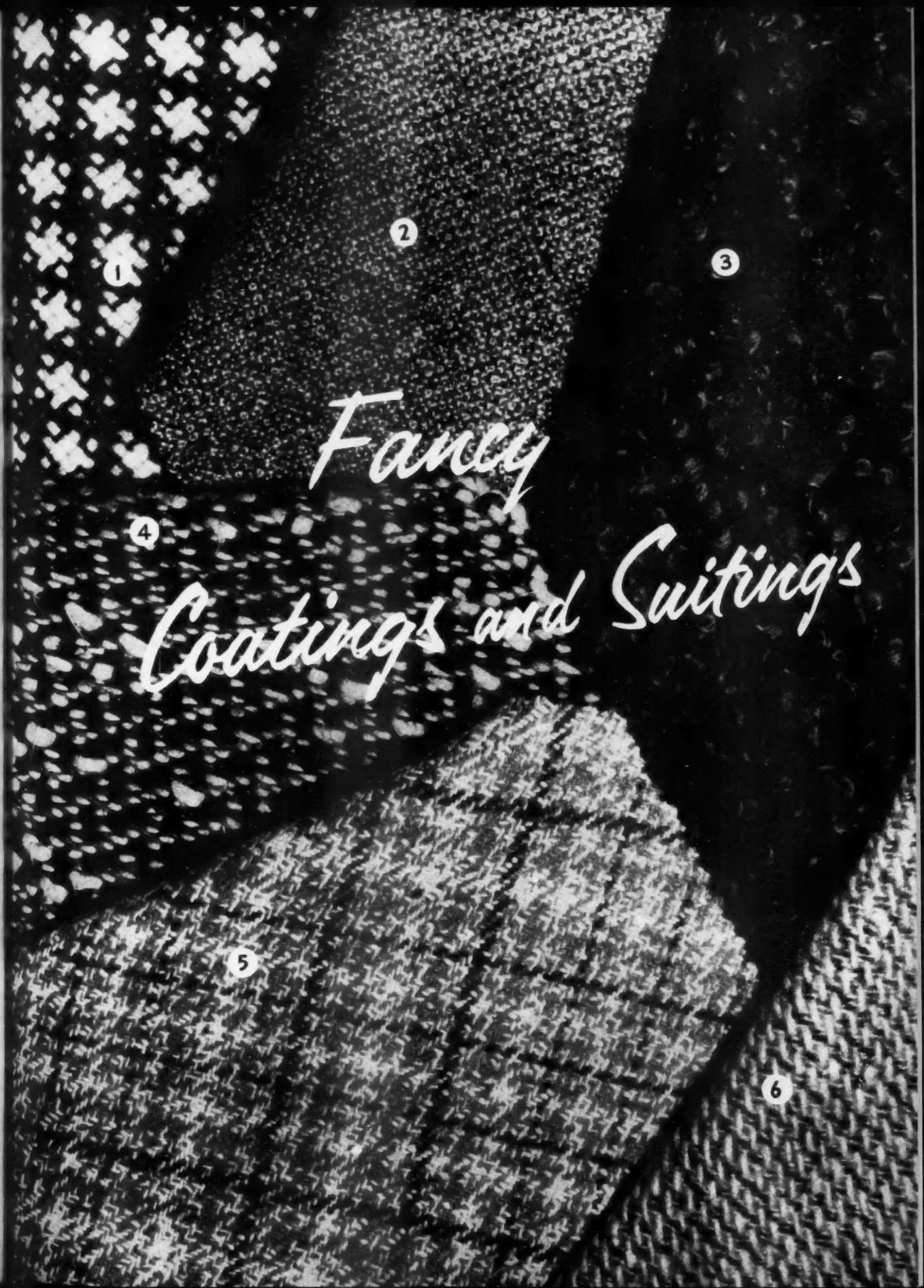
(2) Ladies all wool marl suiting in which black, white and green yarns are used effectively to give a subdued squared design—16-17 ozs./yd.

(3) Ladies fancy coating with decorative loop effect. In black and green, it is 19 ozs./yd.

(4) Fancy slub coating in black and white—19 ozs./yd.

(5) Ladies fancy check suiting in oatmeal, fawn, slate and chocolate yarns—15 ozs./yd.

(6) All wool spring coating in black and white—15 ozs./yd.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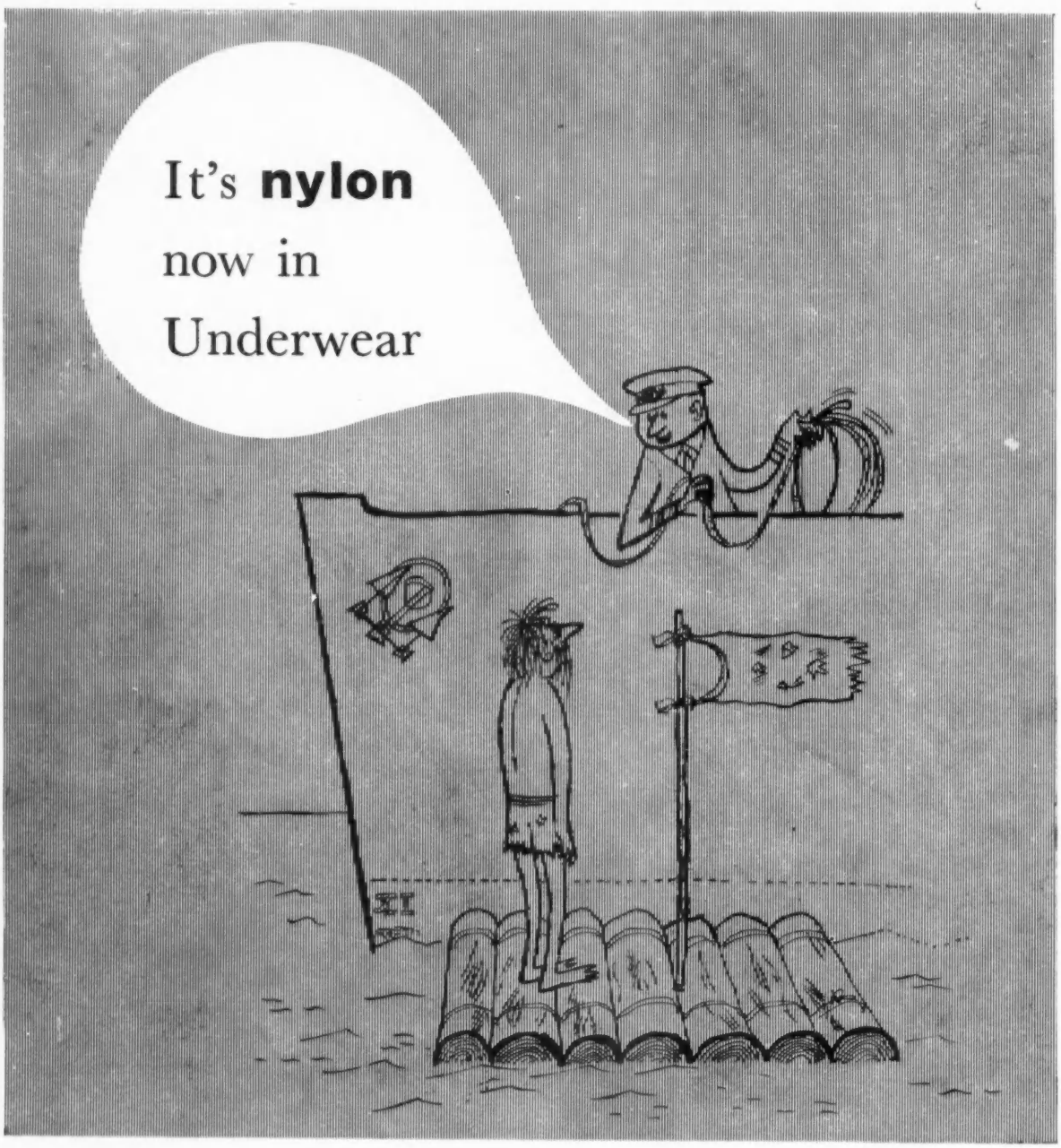

Times have changed since vests and pants were blanket-like in weight and texture. Nylon has emancipated men's and women's underwear—bringing lightness, freedom, strength and self-respect to the humblest nether-garment. How *much* nylon with how much wool or cotton? That's the question. Our technical people can help you answer it without a hazard or a guess.

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The Preparation of Homogenized Sizes

From tests carried out, the author concludes that mechanical reduced sizes keep better and the viscosity of the solution can be kept at a steady level. Cooking time and temperature are lower and savings can be achieved in quantity of starch and in drying

By K. RAMASZEDER

OF all processes preparatory to weaving, slashing probably exerts the greatest possible influence on the quality of the web of warp yarns. In the loom, the ends on the beam are subjected to a wide range of mechanical stresses, the most important being bending, pulling and frictional resistances, etc. It is essential, therefore, to apply to all the yarns a protective coating which lays and secures to the body of the yarn all protruding fibres thus endowing each end with greater uniformity and smoothness and imparting increased tearing strength. The coating for the yarn—the size—must not, however, diminish the resilience of the yarn or lower its manipulative properties.

Good sizes must fulfil several requirements. In general, selection of slashing materials, with the related question of production methods is governed by two principles: (*a*) the quality and economy of sizing. These two requirements may at first seem contradictory but recent sizing processes prove, however, that by a correct choice of the sizing process, better material can be produced at lower cost. In this article two of the most widely used sizes—wheat and potato starches—are discussed.

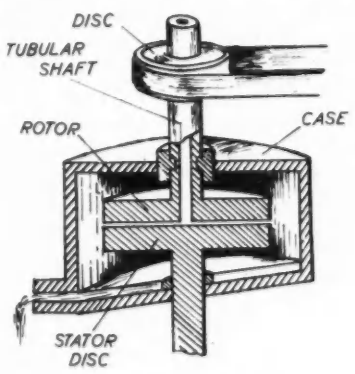


Fig. 1. Early colloid mill

In size preparation, the starch is decomposed in vats or autoclaves. The thin-flowing starch suspension is brought into a state of dispersion by boiling and by the admixture of disintegrating substances. During that stage, the starch grains swell to several times their volume and break up, thus forming a paste of high viscosity.

Homogenizers

Plauszon designed his first colloid mill (Fig. 1) in 1920 and since then tremendous developments have occurred in installations for the dispersion of solid-liquid compounds. These improvements are of primary concern for industries working up large quantities of raw materials within the colloidal dimensional range. This made the textile industry keenly aware of the availability and possibilities of those installations for providing good film formation and mechanically dispersing the starch solution: the homogenizers. In the past 10 years, the classical method of cooking sizes mentioned earlier has been gradually supplanted by the use of homogenizers.

Homogenization consists in driving the suspension fed into the homogenizers through ring segments bevelled at various angles and rotating at high speed. The section of the rings may be adjusted in steps of 1 micron. The relatively high pressure in the narrow clearances combined with the centrifugal force creates a dynamic impact, as a result of which the starch grains break up into fine, minute particles. The dispersion is so high that a colloidal solution results. Mechanical dispersers recently applied in the textile industry may be generally classed into high and low pressure homogenizers.

Manton-Gaulin High Pressure Homogenizer

The Manton-Gaulin installation operates in the following manner. The

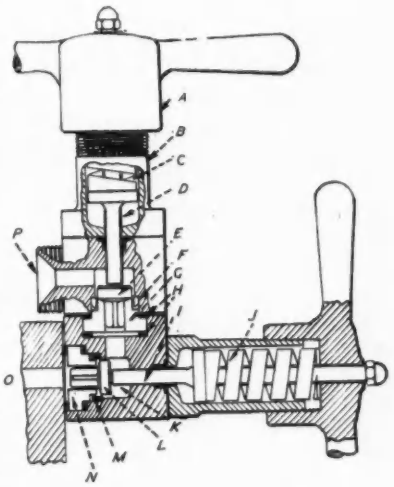


Fig. 2. Homogenizer. A-pressure adjusting handle, B-handwheel support, C-homogenizing valve spring, D-valve rod, E-second homogenizing valve, F-impact ring, G-homogenizing valve seat, H-valve seat washer, I-valve rod, J-homogenizing valve spring, K-pressure area, L-homogenizing valve, M-impact ring, N-homogenizing valve seat, O-inlet, P-package

starch solution heated to 180°F. (68°C.) in accordance with the relationship $Tc = 5/9\ TF = -32$—is forced by a plunger-type pump under high pressure into the homogenizer shown in Fig. 2. The solution entering through an inlet is forced through a narrow valve clearance and flung at extremely high speed against the impact ring. The pressure is adjusted by a spring-action hand control device, which serves to set the valve clearance. The diameter of any segment of the valve spring determines also the cross section. On the base of the relationship expressing the law of continuous flow,

$$V = f_1c_1 = f_2c_2/\text{cmm./sec.}/$$

the volume V of the fluid passing through the pipe of a given diameter f determines—similar to the Venturi meter—also velocity c. Accordingly,

then, the speed arising in the narrowest cross section can be written thus:

$$c_2 = \frac{2g}{A - (f_2)(f_1)^2 + \zeta k} \frac{p_1 - p_1}{\tau} \text{ (m./sec.)}$$

Here, the factor of the tapering segment loss is low, varying between 0·03 and 0·05. This means that the labour potential of the liquid is transformed into impulse with a very high degree of efficiency. The 3000/psi pressure rate given for the Gaulin homogenizer corresponds to 207 atp. Knowing the diameter of the segments, the impact speed of the granules: c_2 can be determined. Under the combined effect of the extremely high speed of 175 m/sec. and of high pressure and dynamic impact, when exposed to hydraulic shear, the granules decompose into minute particles.

The solution is then propelled between a valve and a valve seat in a space under predetermined pressure, where the same process is repeated. The homogenized solution is discharged at atmospheric pressure. The sudden pressure drop on the liquid after it has been exposed to high pressure produces an explosive reaction which, combined with the effect of the vehement dynamic impact, results in a breakdown into micro-granule size particles.

Low Pressure Disperser and Homogenizer

The Tri-Homo (Fig. 3) combines pressure and rotary action for crushing the starch particles in solution. A distinctive feature of the unit is the triple

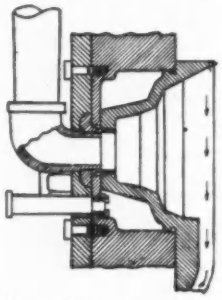


Fig. 3
The
Tri-Homo

dispersion accomplished by driving the solution through three bevel ring segments of diverse angles. A centrifugal pump forces the solution through the inlet of the homogenizer into its stator part, from which it is conveyed through the clearance between the high speed rotor and the stator into the storage tank. The clearance of the segment is controlled by a handwheel. The rotor revolves at high speed within its stator, and the high pressure set up in the narrow clearance combined with the centrifugal shear causes the granules to break down.

The high peripheral velocity on the conical surface of the high speed rotor adds steadily increasing tangential force to the grains thrust towards the larger diameter. Their impact against the different surface angles causes extremely intensive turbulence in the solution. This threefold turbulence in the space where the centrifugal force creates higher pressure results in the high dispersion of the grains. A feature of this model is that pressure is kept comparatively low, because the centrifugal action replaces the high pressure of other types of homogenizers.

It is interesting to examine the relationship between the rotor revolution number and the resultant centrifugal force and one can begin by examining the radial flow caused by rotation. Here, due to the centrifugal forces arising in the volume of the liquid, particles pressing on the parts distal from the centre produce increased pressure which reaches its peak at the largest diameter. The following analyses hold good only if one assumes that between the stator and the rotor, the solution is driven round with the rotor's angular velocity ω. In that case, according to Fig. 4/a-b, the centrifugal force arising in element "dm" of the solution

$$dC = \frac{\tau}{g} \text{b.r.}a\text{.dr}$$

The radial pressure increase is caused by the centrifugal force. The element in question presses against the outer cone surface f, the size of which $f = \text{b.r.}a$, hence the extent of the pressure increase $dp = \frac{dC}{f}$; substituting and arranging

$$dp = \frac{dC}{f} = \frac{\tau}{g} \omega^2 2\tau dr$$

The increased pressure between the inside and outside rotor surfaces, having radii r_1 and r_2 respectively is obtained by integrating

$$\int_{p_1}^{p_2} dp = \int_{\tau_1}^{\tau_2} \frac{dC}{f} = \int_{\tau_1}^{\tau_2} \frac{dm.r.\omega^2}{f}$$

where $dm = \frac{\tau}{g} V = \frac{\tau}{g} f.dr$

Substituting $\int_{p_1}^{p_2} dp = \frac{\tau}{g} \omega^2 \int_{\tau_1}^{\tau_2} r.dr$

wherefrom $p_2 - p_1 = \frac{\tau}{g} \omega^2 \frac{\tau_2^2 - \tau_2^2}{2}$

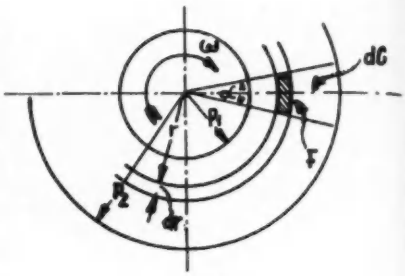
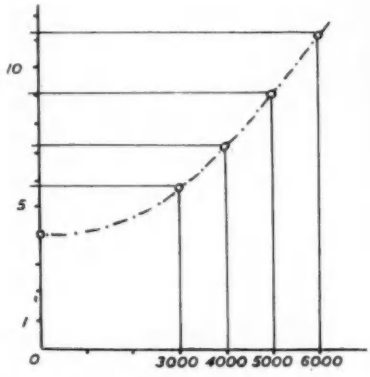


Fig. 4a.



Pressure increase due to the centrifugal force P2. Rotor revolution/min. n.

n r/p	3000	4000	5000	6000
ω 1/SEC	314	419	524	628
p2 ATM	5·87	7·35	9·22	11·45

Fig. 4b. Pressure increase in the function of the revolution number

Due to the comparatively low pressure, Tri-Homo units are considered by some to have longer life than homogenizers operating with high pressure. The liquid fed into the unit should be kept meticulously clean, because even minor foreign matter, such as bits of yarn or even tiny metal particles may seriously affect the narrow clearance between rotor and stator. Accurate adjustment of the predetermined tolerance of wear is an important requirement from the point of the clearance. The capacity of the Tri-Homo homogenizers is more than that of the Gaulin units. The smaller Tri-Homo unit has a throughput of about 2800 lt. size per hour.

Experimental

Both cooked and homogenized starch sizes are disperse systems in which two main components may be

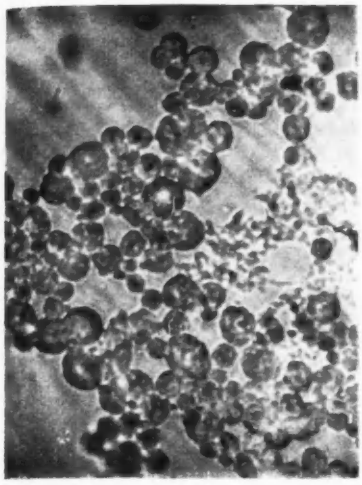


Fig. 5. Homogenized size × 1,050

discerned as the disperse part (starch) and the dispersion medium (water). The characteristics of such systems, e.g., the degree of dispersion, the shape of the particles and the manner of their spatial distribution are considerably affected by the form of the homogenizer and homogenizing conditions.

Determination of the Size of Starch Grains

Tests were made with size prepared in the Tri-Homo homogenizer, the method employed being as follows: 24 kg. of wheat starch was admixed to 400 lt. of water and turned into paste at 78°C. It was then passed once through the homogenizer adjusted to a clearance diameter of 0·03 mm. The outflowing size had an easy-flowing consistency as against the highly viscous size fed into the unit. This homogenized size is shown in the micrograph under Fig. 5 in 1050-fold enlargement. The uniform magnitude of the broken down starch granules is clearly discernible. The measured average diameter of the granules was 2·3μ. The dispersion of the starch grains is shown in Fig. 6, where the grain diameter (abscissa) has been plotted against the frequency of their occurrence (ordinate). Fig. 7 represents the dispersion of the order of magnitude of starch granules in cooked starch size. Here, the average diameter of the granules was 5μ. It may be observed that compared to the uniform magnitude of the homogenized starch grains, here, their order of magnitude was rather heterogeneous. Fig. 8 shows the dispersion of the order of magnitude of the native starch grains used for the test. Here, the average diameter of the grains was 20μ.

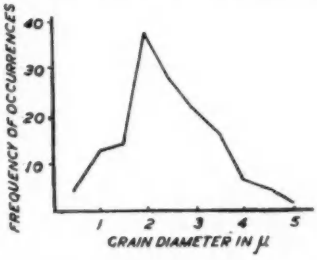


Fig. 6. Dispersion of starch grains

Strength of Starch Films

Film formation by starch size drying is a process that belongs to the realm of colloid chemistry. The starch size is transformed into a gel of deformed system. One manner of producing deformed systems of dispersed structure consists in pouring out colloidal solutions, suspensions, emulsions or lyogels in an adequate thickness and drying them. In this manner, deformed xerogels are obtained.

Due to their dimensional conditions, films are better suited for examination than lumpy gels; they are far more isotropic as far as mechanical properties are concerned. For instance, in the course of drying up, complicated diffusional and shrinkage processes occur inside the gels resulting in lumpy gels showing considerable structural unevenness and buckle.

The tensile strength of cooked and homogenized starch films of various concentration was subjected to test. The films were prepared by pouring the size on a glass plate covered by a plastic sheet (to facilitate easy removal of the film from the plate without fracture), and spreading it as evenly as possible with a glass rod. After drying up, the film was removed from the glass plate and placed into a drying compartment for 24 hours. After removal, the film was inserted between a square plotting paper sheet of mm. scale, and cut up with a razor blade into 1 mm. broad strips. The thickness of the strip was measured with a micrometer at several points,

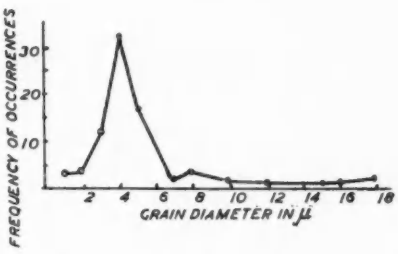


Fig. 7. Order of magnitude of starch granules; average diameter of granules 5μ

whereafter a 10 mm. length was gripped in a Schopper fibre tensile tester and broken. Tensile strength tests were made with dry and wet strips to determine the extent in which moisture diminished the tensile strength of the films. Table I shows the tensile strength of films made of cooked and homogenized starch sizes.

A comparison of the tensile strength of films made from cooked and homogenized starch sizes of various concentration was plotted in Fig. 9.

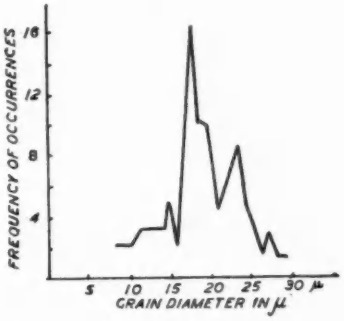


Fig. 8. Average diameter of grains 20μ

Table II as well as Fig. 9 indicates that the tensile strength of the films grows with increasing concentration. The reason here is, that to the given quantity of water, the number of starch grains increased (the adhesive surface became larger) and the increased attraction among the particles resulted in increased tensile strength. This finding led to practical conclusions, namely it can be presumed that in case the quantity of starch were diminished but the number of the

Table I

No.	Kind of size	Concentration p.c.	Tensile strength g	Elongation p.c.	Time sec.	Method of tearing	Remark
1	Wheat starch	2·5	91·6	1·8	62·4	dry	cooked
2	,,	2·5	3·9	2·6	24·2	wet	,,
3	,,	4·0	133·3	1·0	55·3	dry	,,
4	,,	4·0	4·3	1·4	16·5	wet	,,
5	,,	2·5	93·9	1·6	60·2	dry	homogenized
6	,,	2·5	2·4	2·3	20·1	wet	,,
7	,,	4·0	140·2	1·1	61·3	dry	,,
8	,,	4·0	3·9	1·5	18·9	wet	,,
9	,,	2·0	88·7	1·2	58·3	dry	,,
10	,,	3·5	127·9	1·1	52·6	dry	,,

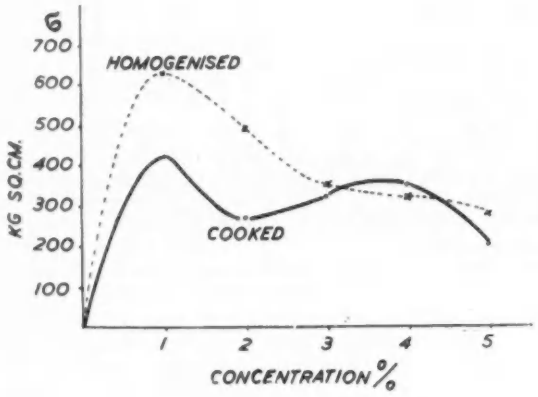


Fig. 9. Tensile strength of film declines with increasing concentration

Table II

No.	Concentration p.c.	Manner of film formation	Dimensions of the test specimens			Surface	P	σ	Denomination
			length cm.	thickness cm.	width cm.	sq. cm.	kg.	kg./sq. cm.	
1	1	30 ml. per 190×240 mm.	1	0·00149	0·1	0·000149	0·06310	423·49	Cooked wheat starch
2	2		1	0·00246	0·1	0·000246	0·06561	266·70	
3	3		1	0·00281	0·1	0·000281	0·08800	313·16	
4	4		1	0·00298	0·1	0·000298	0·09718	349·39	
5	5		1	0·00510	0·1	0·000510	0·10200	200·00	
6	1		1	0·00146	0·1	0·000146	0·09200	630·13	Homogenized wheat starch
7	2		1	0·00192	0·1	0·000192	0·09340	486·45	
8	3		1	0·00289	0·1	0·000289	0·09998	345·94	
9	4		1	0·00316	0·1	0·000316	0·10216	323·29	
10	5		1	0·00470	0·1	0·000470	0·13145	279·68	

starch grains were increased by homogenization, the tensile strength of the film would increase as a result of the increased surface. This is clearly observed from Table II.

Fig. 9 shows that the tensile strength of films declines with increasing concentration and this apparently contradicts the previous statement namely, that the tensile strength of films increases with growing concentration. Careful scrutiny of Table II, however, shows that the thickness of the films grows at a far higher rate than their comparatively moderately increasing tensile strength. In this case the reason is attributed to the rapidly forming coat on the surface of the starch size hardening as drying proceeds and thus preventing part of the moisture trapped inside the film from escaping. This assumption is substantiated by Table I indicating that water impairs the tensile strength by about 96%. The result of the test series performed to determine the concentration of starch sizes by desiccation further substantiated our assumption. It was found that the apparently dry substance contents of the desiccated starch size were more than the known measured quantity of the dry substance, and the higher the starch concentration, the greater was the difference between the measured dry ingredient and the apparently dry substance contained in the size.

Fig. 10 shows a microgram of cooked size film. Fig. 11 that of homogenized size film in 210-fold magnification. The uneven consistency of the film made of cooked starch is clearly visible (thickening, creases) if compared to the homogenized film. The former inconsistency is largely due to the significant

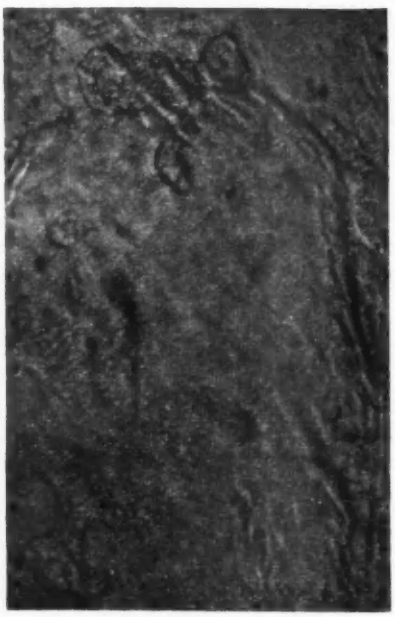


Fig. 10. Cooked size film

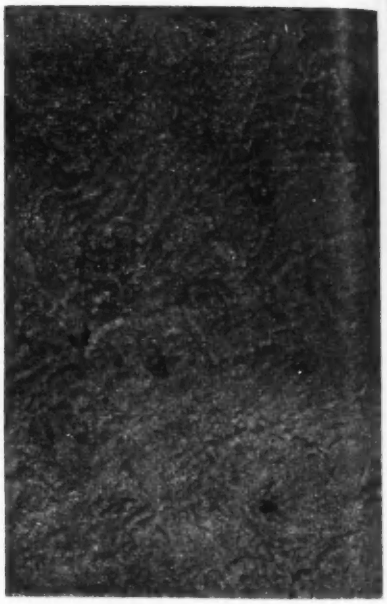


Fig. 11. Homogenized size film

difference in the size of the grains in the cooked starch.

Resistance of Starch Films to Abrasion

It is one of the requirements of sizes to confer on warp yarns as high a resistance as possible to the abrasion set up in lease rods, warp stop-motions, healds, reeds, etc., and in this connection the question arises of means with which to determine the extent of abrasion resistance of starch films. There appears to be no answer to this problem in available literature and it must be assumed that the matter has not yet been adequately examined. As the strength of sized fibres subjected to abrasion depends to a large extent on the abrasion resistance of the coat of starch film covering the yarn, it was decided to measure the forces required for abrading films of variable concentration.

In this experiment, the desiccated starch films were cut up into strips as described earlier and their thickness ascertained. Films of equal thickness made from various size concentrations were selected and the strips exposed to abrasion tests on the tester shown in Fig. 12. The results derived from testing 100 films of each concentration are set out in Table III.

The diagram plotted of the values shown in Table III indicates that the abrasion resistance of the films increases in approximately direct ratio with the concentration (see Fig. 13).

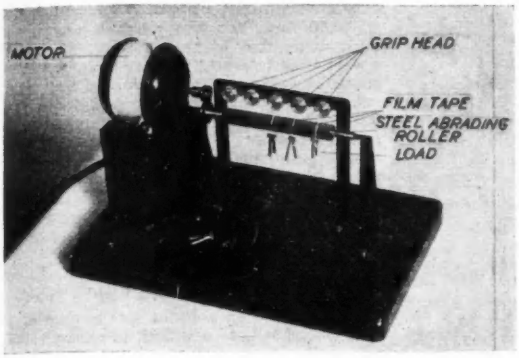


Fig. 12. Instrument for carrying out abrasion tests

Table III

No.	Concentration p.c.	Labour required for abrading the film mkg.	Kind of film
1	2	0·906	Potato starch
2	3	1·522	,,
3	4	2·103	,,
4	5	4·260	,,

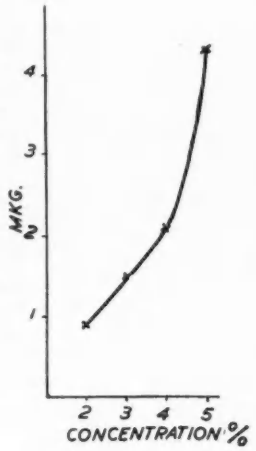


Fig. 13. Abrasion resistance of films increases in approximately direct ratio with concentration

Depositing Tendency of Starch Sizes

The observation of the settlement of homogenized starch sizes yielded remarkable results. Our method was as follows: 40 ml. of each size concentration was poured into a gauge glass, allowed to stand for 40 hours, whereafter the rate of the deposit was read off. The average grain size of the cooked starch was 5·1μ, that of homogenized starch 3·1μ. The results of the test are given in Table IV.

The values in Table IV are characteristic of the starch grain dimensions. Particles dispersed in liquid medium can perform two-fold motion provided no outside interference, such as temperature difference, etc., disturbs them, viz. gravitational fall and thermal movement. The gravitational fall of the particles can be expressed by the Stokes-equation, according to which the falling velocity of the particles (v)

$$v = \frac{2r^2 (Q - Qf)\, g}{9\eta}$$

where r designates the radius of the particles assumed to be spherical, Q, the density of the substance of the particles, Q*f* the density of the medium, η the internal friction of the medium. As seen from the table, the tendency of homogenized sizes to deposit is less than that of cooked sizes. The fall of the particles due to gravitation produces the deposition of the disperse system. Due to it, the homogeneity of the particles' dispersion declines, and the rate of such decline is the higher, the coarser the system. Namely, according to the Stokes equation, the velocity of depositing is in line with the square of the particles' movement.

Transparency of Starch Sizes

According to Tyndall's (or more accurately Tyndall-Faraday's) phenomenon, the path of a beam penetrating sidewise into a disperse system in a transparent disperse medium before a dark background becomes visible. That phenomenon is based on the dispersion of light, and the turbidity of disperse systems is due to it. By means of the Tyndall light phenomenon, the degree of dispersity of colloidal solutions can be computed and their concentration can be determined.

Relative experiments were made with potato starch, preparing sizes of 1 to 5% concentration with distilled water. When the sizes began to grow pasty (which in potato sizes set in at 65-67°C.), they were cooked for 5 mins., cooled—over 30 mins.—poured into a test glass and their transparency was determined. The tests were made with a "Visomat" photo-electric cell photometer. The volume of the samples tested was invariably 100 ml. Transparency was compared with that of distilled water. To ascertain whether or not the results could be reproduced, the tests were repeated several times running, and after several weeks they were repeated again with starches derived from different batches. The tests were duplicated also with homogenized sizes.

To determine the effect of the ageing of the sizes, on the accuracy of the results, the transparency of the starch sizes of various concentration was determined after allowing them to stand for 1-2-3-4-5 hours respectively. During these times, the samples were kept in a thermostat at 40°C. The results appear in Table V.

Fig. 14 shows the transparency of cooked and homogenized potato starch size after 30 mins. standing at 40°C. It will be observed that the homogenized size has a higher transparency, even though the concentration be higher. Further, the transparency of homogenized size shows but slight variation with increasing concentration —which is in contrast to the behaviour of cooked sizes.

Table V

Time hour	Concentration per cent. 1	2	3	4	5
	Transparency per cent. at 40 C.				
½	65	52	33	23	18
1	65	52	36	35	17
2	65	52	36	35	17
3	69	55	40	24	25
4	67	54	43	24	24
5	64	54	47	24	22

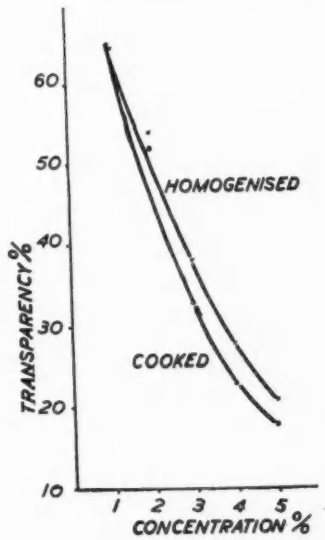


Fig. 14. Transparency of cooked and homogenized potato size

Table IV

No.	Kind of Starch	Concentrated p.c.	Time h	Volume of deposited portion ml	Remark
1	Wheat	1	40	13·23	cooked
2	,,	2	40	31·79	,,
3	,,	1	40	24·16	homogenized
4	,,	2	40	37·89	,,

The Growth of the Tufting Industry in America

In 1956, *U.S. carpet production was* 114 *mill. sq. yds., of which* 19% *was Axminster,* 14% *Wilton,* 22% *velvet, and tufted constructions* 44%

ABOUT the same time as Cobble Brothers Machinery Co. was founded, the first really practical tufting machine was built. Almost immediately Cobble Brothers began to build tufting machines by adding a tufting unit to used sewing machine heads. Soon they had designed and were casting their own machine frames, and Cobble tufting machines began to build the reputation which today make the name synonymous with tufting machines, said Mr. M. M. Beasley (vice-president, Cobble Brothers Machinery Co., America), speaking recently at Manchester College of Science and Technology.

In 1940 the idea was conceived of a machine which would tuft the width of a bedspread all at once and pass the material through the machine in a continuous operation. This would reduce the labour still further than that needed with the previous single needle and multi-needle machines. The first machine, built on a fabricated frame made out of angle iron and channels had a needle spacing of 1½ ins. One hundred needles were all that could be accommodated in the machine and thus was born the yardage tufting machine. Five of these were built, but production was stopped due to the last war and not continued until 1946 when the first cast yardage machine was designed. This machine continued for several years until the present enclosed types of machines were introduced.

About the same time, said Mr. Beasley, people began to experiment with the manufacture of tufted rugs. Bath-mats came first, being closely related to the tufting on bedspreads and it was discovered that putting latex on the back made a throw rug that would not skid and would retain its tufts; in a rapid though gradual process of evolution, tufted carpet came into being. Earlier tufted carpets were all cotton. Other fibres came into use later and these were man-made of various types with viscose absorbing large portions of the share formerly exclusively cotton.

In the U.S. the established carpet manufacturers wanted no part of tufting. They had looms and equipment worth hundreds of thousands of dollars for producing loom-woven carpets and could see no future in tufting. Eventually, however, through loss of business to the relatively inexpensive tufted carpet they bought tufting machines to make a tufted product to compete with the products coming out of Dalton and surrounding areas. At the beginning, some of the carpet manufacturers cheapened the tufted article in order to meet competition and to sell at a lower price, but, eventually, the tufted carpet was put into a class by itself. Today, it was no longer regarded as being an inferior type of carpet but simply a different type of carpet. It had its own place and had advantages that were inherently its own which cannot be taken over by carpet made on any other manufacturing process. The one which is first thought of, and which is unquestionably of great importance is price. One of the larger carpet manufacturers said there was a price differential of about 25% or more between comparable quality woven and tufted carpet. He estimated that tufted carpet of the same weight, type and quality could be produced on tufting machines for 25% less than it could be loom woven. Several factors were involved in this connection. One was the actual labour savings realised from the approximately 1,000% increase in production. Another, and very important, consideration was that the higher productivity of the equipment, created a much better return on the capital invested. Further, tufting, required less outlay for equipment than weaving so that the manufacturer was actually able to produce 10 to 20 times as much on a machine which cost, perhaps, half as much as a loom.

Machinery Problems

As machinery builders, they had experienced many problems as the tufting industry rapidly grew, said Mr. Beasley, and they had been able to solve them as they had arisen. The drive on the cloth feed transmission on which a patent was now pending both in America and the U.K. was developed to solve one of the most vexing problems, that of "stop marks." A stop mark was a line across the fabric caused by a difference in the length of the stitches at the points where the machine was stopped and started. Usually it showed up as a gap in the carpet pile, and was a serious defect which might result in that roll of carpet becoming a "second" unless it was so slight that the finishing processes would obliterate it. This problem was much worse on loop machines, because each stitch was fed the same amount of yarn and when the backstitch was made shorter, the extra yarn was put into the pile. This accentuated the defect by making a difference in the pile height as well as the stitch length, and it was more apparent on low nap fabrics than on fabrics with a deeper pile.

In analysing this problem the fault was finally traced to lost motion, or "backlash," in the gear train driving the rolls, but no matter how much precision was introduced into the gear manufacturing, or care in assembly, it just was not practical to build gears without some backlash. The problem then resolved itself to the provision of means for cancelling out the backlash. This called for a force which would keep the gear teeth always in contact in one direction, never allowing them to separate and make a difference in the relative motion between the driven gear and the driver. After numerous experiments and trials of different nature, it was finally realised that an ideal force for this purpose was the tension in the backing fabric. It had always been standard practice to introduce control tension into the backing fabric by running the output feed roll about 4 or 5% faster than the input feed roll, but on all machines prior to the development of transmission, the fore and aft rolls might move in unison by whatever amount of slack was present in the gears. This caused the difference in stitch length, where even a slight difference in uniformity stood out like a soldier out of step.

Preventing Cloth Slip

Cobble Brothers solution was to provide spiked feed rolls fore and aft to prevent all possibility of the cloth slipping on the rolls and to drive these by independent, high ratio, single reduction worm gears which could not be driven in reverse. Then by driving the rear roll slightly faster than the front, the resulting cloth tension kept the backlash in the front gear-set opposed to that in the back. This prevented the cloth moving either forward or backward except as it was driven by the machine.

In overcoming this major obstacle, the way was opened for broadloom fabrics and proceeded into the development of pattern machines and other equipment which had meant much to the prosperity of the tufting industry. Some comparable figures released by the U.S. Department of Commerce, Bureau of Census, and distributed by the Tufted Textile Manufacturers Association showed that the production of tufted floor coverings had increased as follows:—

	Production
1939 ..	1,210,000 sq. yds.
1946 ..	6,500,000 ,,
1956 ..	83,277,000 ,,

In 1939 total broadloom (6 ft. or over) carpet production was about 52 million sq. yds., all of which was woven. This had risen to 73 million sq. yds. in 1952, of which 36% was Axminster, 20% Wilton, 28% velvet and 14% tufted. In 1956 total production was 114 million sq. yds., of which 19% was Axminster, 14% Wilton and 22% velvet, but tufted had risen to 44%.

While loom woven carpet had not lost much ground production-wise, it had not made the normal gains it should have made in view of rising population, increased new home building, and rising standards of living. Almost all the increase in carpet consumption was due to the introduction of tufting. To compare the year 1956 with 1952, the production of the various carpet types was as follows:—

Total broadloom carpet production	up 56%
Wilton	up 14%
Velvet	up 22½%
Axminster	down 17½%
Tufted	up 314%

In conclusion Mr. Beasley said the tufted process created new markets. It had accomplished a feat which the woven carpet trade has tried for years to do, i.e., it had increased the per family use of carpet. This rose from 1·6 sq. yds. in 1952 to 2·2 sq. yds. in 1955. A standard objection was plain colours and textures. This had largely been eliminated now by the introduction of new patterning equipment, but even if this were not so, public taste changed, and as the American housewife took plain carpet colours and textures to her heart, so would the English housewife.

Production and Use of Man-Made Fibres for Carpets

The Federation of British Carpet Manufacturers recently held a one-day conference on "Developments in the Application of Man-Made and Synthetic Fibres to Carpet Production" at the headquarters of the British Rayon Research Association, Heald Green Laboratories, Wythenshawe, Manchester. Abstracts from the papers given appear on this and succeeding pages

By H. SNEYD, A.T.I.†

ONE of the particular problems apparent with standard staples, even when incorporating coarse deniers, was that the resulting carpets were not as full in handle as those produced from wool. This was probably due to the low density and inherent crimp of wool. To remedy the deficiency a new staple with a chemically induced, and therefore permanent, crimp was introduced. As the degree of crimp obtainable in manufacture decreases with denier, commercial production has concentrated on 3·0, 4½, 8 and 15 den. in a range of staples suitable for processing on all major systems of spinning. All the fibres are matt except in the case of 8 den. 2½ ins. staple which is also produced as bright material. During processing "Fibro" is straightened and it is an advantage with the crimped material to recover the crimp by subsequent wet treatment. In carpets this may be obtained by direct application of steam, or during yarn or piece dyeing. Crimped "Fibro" is proving of value wherever improved bulk and resiliency are required, and with its more wool-like properties is serving to narrow the gap between man-made and natural fibres by fulfilling the requirements of a carpet staple. Satisfactory processing has been achieved on all systems of spinning and the fibre is becoming increasingly popular, particularly in the case of tufted carpets.

Fibre M55

Although crimped "Fibro" improved the bulk and resilience of viscose staple, it remained apparent that viscose tended to soil more rapidly than wool. This was especially detrimental in the case of tufted carpets where only plain carpets are produced. The rapidity of soiling was attributed to the serrated cross-section of viscose, tending to pick up and hold dirt. Although soil resistant finishes can be applied, a more fundamental approach was the development by Courtaulds Ltd. of Fibre M55. This fibre is extruded as a bean shaped cross-section with a smooth exterior surface, thereby showing less tendency to soil.

Fibre M55 provides resistance to soiling with good abrasive properties of benefit in wool blends. The smooth cross-section, however, precluded the insertion of crimp and the fibre is therefore less resilient than the crimped material. For this reason M55 is mainly used in blend with crimped "Fibro," particularly as 8 den. 2½ ins. bright fibre in cotton spun yarns for tufted carpets. The fibre is also produced in 4 ins. staple for spinning on the woollen system and in 6 ins. staple for spinning on the flax and jute systems. To improve the handle and resilience the 2½ ins. staple is also available as 15 den. matt.

Matt crimped "Fibro" is also produced as spun dyed colours by introducing the colour pigment into the spinning dope, thereby providing a high degree of colour fastness. Originally a range of six colours were available for use on the cotton and long staple systems and sold to the trade under the trade mark "Fibro-Duracol."

Recent major developments have however, resulted in a policy change with regard to "Fibro-Duracol" colours. Work was undertaken with a view to providing an increased range of carpet colours, suitable for use not only as solid shades, but also for colour blending. A large range of blended carpet shades can be produced using colours carefully selected according to their physical properties, i.e. their position in the colour solid.

In addition it was apparent that many of the tufted manufacturers were favouring a blend of 15 den. matt and 8 den. bright to obtain increased cover and depth of shade. The cotton spinners also used the 8 den. bright as a spinning aid. As a result of extensive trials the decision was made to produce the new range of "Duracol" colours as 12 den. semi-matt material, thereby eliminating the need to blend 15 and 8 den. For flax and jute spinners, who preferred the heavier deniers, the new colours would be produced in 6 ins. staple as 15 den. semi-matt.

The warmth and resiliency of "Fibrolane," plus a smooth exterior surface, ensures a fibre well suited for blending with "Fibro" or wool, with improvements in warmth and resiliency in the case of the former and economic advantages with the latter. "Fibrolane" has been utilised with success in conventional carpeting as well as the rapidly developing tufted varieties. Processing "Fibrolane" in blend presents no particular difficulties and the wide range of staples and deniers available provide for all systems of spinning. The available deniers include 4½, 9, 18 and 30 in staple lengths of 2½, 4, 6 and 8 ins. These fibres are also produced in a wide range of spun dyed "Fibrolane-Duracol" colours.

Acetate Fibres

Cellulose acetate fibres are used in carpets, particularly tufteds, in the form of 15 den. crimped Celafibre CQ produced by British Celanese Ltd. Staple lengths are

Among many samples used at the sessions were these carpets dyed in strips of six basic colours and various blends from these. Seen examining them are l. to r. Mr. R. C. Cheetham (Courtaulds Ltd.), Mr. C. P. Atkinson (Mather and Platt), Mr. H. Sneyd (Courtaulds Ltd., Rochdale) and Mr. J. A. Kirby (Courtaulds Ltd., Coventry)

provided suitable for use on all systems of spinning, although the major use so far has been on the woollen system. Acetate staple is essentially a blending fibre and is used with viscose staple or wool, lending an attractive warm handle and resiliency to the blend. The cross dyeing properties of acetate/viscose blends may be exploited to produce attractive pebble effects in piece-dyed carpets. Developments are continuing to introduce acetate staple to the cotton and flax spinning systems. Celafibre CQ is available as matt and bright material and a limited range of spun dyed colours are produced, mainly for use in tufteds.

Synthetics

Nylon and other synthetic fibres have not so far been used to any great extent in carpets, although in the U.S. considerable use has been made of nylon in tufted carpets. Enhanced physical properties with regard to abrasion resistance and resilience are obtained when nylon is used in the blend and some work has been done incorporating nylon, 10 or 18 den. as 10% to 20% of the blend. In America blends have been noted to contain as low as 2½% nylon indicating its use for prestige value rather than actual physical advantages. Acrylic fibres have also been used with a view to improving yarn bulk and covering power. In general, however, the price of synthetic fibres is prohibitive of their widespread utilisation, but it is clear that their use development in carpet yarns will increase.

Woollen System of Spinning

Man-made fibres in blend with wool can be processed satisfactorily on existing systems, producing the type of yarn required by the manufacturer. With 100% man-made fibre yarns a minimum of alteration is necessary. The majority of yarns produced for conventional carpets are spun on the system, and long standing associations, together with the increasing use of wool and regenerated protein fibres will ensure the production of a considerable quantity of tufting yarns by the woollen spinners.

Crimped "Fibro" is proving especially beneficial to the woollen spinners due to the close approach to the characteristics of wool in processing behaviour. All the deniers are utilised, and although 4 ins. is the general staple length, some 2½ ins. material is included in blends. Due to the open and clean state in which man-made fibres are delivered, less opening is required than with a wool blend. Standard techniques will therefore result in a more thorough blending. The equipment usually consists of two fearnoughts.

Blends often contain "Fibro" of more than one denier or staple, with other fibres such as wool and "Fibrolane." Whether hand or automatic methods are employed, thorough blending is necessary in order to ensure the production of uniform properties. Hand blending is carried out on a stack mixing basis, where the materials are layered out and oiled in the conventional manner prior to feeding to the fearnought by braking down from the side of the stack.

Automatic blending is also successfully employed and may comprise as follows: A weighing mechanism from which the weighed blend is drawn by a wool fan into the feed sheet of an opening fearnought. The stock is then blown by a rotating fan into a centre blender from which it is taken to a second blender and then fed to a final hopper and fearnought. The well blended stock is suction drawn round a vortex spray oiler, with a micrometer valve for accurate oil application.

The application of oil is necessary to provide lubrication and fibre control during carding and spinning on woollen equipment. For most blends of "Fibro" and wool, the addition of 10% heavy carding oil ensures satisfactory processing. When "Fibrolane" is present in the blend a self-emulsifying oil is recommended, as the easy removal of such oils in a neutral scouring bath, does not damage the "Fibrolane." Recent developments have furthered the use of anti-soiling agents as lubricants, thereby eliminating the necessity for scouring, with the claimed benefits of soil resistant properties bestowed on the finished carpet. Such an agent is Cirrasol AR, and the application of 1% on the weight of the blend, plus 5% water, has proved successful in processing with crimped "Fibro," "Fibrolane" and wool. Care must be taken, however, to ensure, in the absence of scouring, that there is no risk of contamination by oil from the card clothing or other machinery.

Carding

Major modifications are unnecessary on the carpet card for processing man-made fibres, although certain precautions will prove advantageous. As man-made fibre webs run more slackly than with wool, increasing the speed of the take-off lattices and the shortening of the traverse on the intermediate feed plaiting mechanism may overcome any excessive spreading of the web. Because "Fibro" and "Fibrolane" do not become embedded in the card clothing, a decrease in stripper speeds is of value and lower fancy speeds are also necessary. The fancy cover should either fit closely, or have a clearance of some 3 ins., to prevent rolls of fibres slipping back into the swift. Furthermore, the slippery nature of the fibres may require more rubbing power at the condensers.

Yarns of 80–110 yds./oz. are generally spun for carpet work, with some 4 t.p.i. "Z," and then folded with twists varying from 2½–3½ t.p.i "S." For yarns which are to be used in tufted carpets, slightly higher twists are proving valuable in giving increasing firmness to the resultant pile.

The jute system has long been associated with the production of cord and Brussels type carpet yarns, and the low conversion costs enjoyed are proving attractive to the manufacturers of tufted carpets. Satisfactory processing, with small waste losses, is experienced with man-made fibres, and the 6 or 8 ins. staples in use are providing attractive deep non-shedding piles. Blending from several bales is necessary in order to overcome any variations in moisture content or finish which may exist. Great care must be taken when blending different fibres or colours due to the poor lateral blending of the flax and jute type cards. Satisfactory blending may be achieved in a number of ways:—

Working from a hand prepared sandwich blend, weighed dollops can be placed on equal measured strips of the card feed sheet, or the sandwich blend may be made on the feed sheet. Double carding may prove advantageous in both these cases. Another method is to pre-blend components on a woollen teaser, providing staple lengths allow, from a sandwich stack prior to feeding the blended material to the card. In this case dollop weights must be reduced to ensure that the material is not too bulky to feed to the card. Most types of flax and jute type finisher cards can be used, and a wide diversity of speeds and settings may be successfully employed in satisfactory processing of man-made fibre blends. Certain advantages may be gained by reducing the main cylinder and stripper speeds and lowering the card draft. The flax card with a production of up to 150 lbs./hour has few equals on any system.

Successful drawing may be achieved on the coarse pinned jute machinery for coarse slivers, whereas lighter slivers may be processed on finer pinned screw gill drafting frames. Two or three passages of drawing are normally used with 18 to 24 doublings. Coarse pinned intersector gill boxes with one passage "Autoleveller" may be used with advantage. Rovings may be used to supply spinning frames although the additional process is largely redundant as good yarns can be obtained by sliver spinning. Satisfactory sliver spun yarns are produced on gill or slip draft frames, at high rates of production using normal drafts. Yarn counts twists may vary from 2½ t.p.i. "S" for conventional carpets, to 4½ t.p.i. "S" for the tufted types.

As carpet pile yarn spinners, the cotton system has only recently come to the fore with the rapid developments of the tufted carpet trade. The reasons for this is the relative cheapness, the fullness of the yarns produced and the processing advantages achieved with man-made fibres on this system. Crimped "Fibro" is the principle fibre in use, giving a yarn of good resilience, bulk and cover with excellent spinning properties. Other man-made staples are also in use, principally of the type of M55, with "Fibrolane" and nylon increasing in popularity for use in blend with "Fibro."

Cotton System

The cotton system lends itself admirably to the production of carpet yarns, since conventional equipment can be used provided suitable adjustments are made for the 2½ ins. staple and heavy deniers utilised, which give greater bulk and cohesion than standard materials. Plant details vary considerably from mill to mill and only a general indication of the necessary equipment can be given. A system which has been found suitable consists of a hopper opener and lattice feeder, with a hopper feeder combined with an opener equipped with an 18 ins. porcupine beater. A finisher scutcher is then employed using an 18 ins. porcupine or Kirschner beater to lap end.

Rather slower beater speeds than are usual for fine denier material have been found advantageous. Furthermore, an increase of the braking action of the scutcher rack heads will enable reasonably high total lap weights of the order of 14/16 ozs./yd. to be obtained. Waste losses may be minimised by covering the leaf bars and reversing the leaf bars and reversing the beater bars.

Tufted carpet yarns require accurate compositions and good regularity if carpets of level appearance are to be produced, especially after dyeing. Man-made fibres contain sufficient variations to make it imperative that an adequate blending technique is adopted, and as many bales as possible should be blended at the start of processing. When blends of different fibres, or fibres of different denier, colour and lustre are to be made, particular care must be taken. Accurately weighed sandwich blends should be made on the lattice by hand or by the use of automatic weighing and blending equipment. Careful

control of mixing and blending will avoid subsequent troubles in relation to such faults as stripes appearing in the finished products.

Standard revolving flat cards can be successfully utilised to process man-made carpet staples, with only slight modification. The use of a long nosed feed-plate is recommended and the setting to the taker-in should be opened out to at least 22/1,000 in. Taker-in speeds can be advantageously reduced to about 350 r.p.m. and flat settings of 14/16 thou. are advised. Feed rollers covered with coarse straight leading edge garnett wire help to reduce any tendency to plucking oc cibde at the taker-in. In order to overcome the breakage which sometimes occurs with light slivers, card slivers in the region of 0·12 hank are generally produced. With standard flat cards, production cannot be expected to exceed 15/20 lbs./hour and to overcome this deficiency roller and clearer type cards with double coiler heads have been introduced with productions of 50 lbs./hour and more. These cards have been specifically designed for use with carpet staples.

With four-line roller drawframes which have insufficient setting capacity to allow for 2½ ins. staple, one line of rollers must be removed, and on older frames it may be necessary to cut the roller stands to obtain the required settings. A divergence of opinion exists as to the number of drawing heads required. At least two are desirable and recommended although with improved blending techniques and sufficient doublings at later stages, one head of drawing is being successfully employed in some instances. Normal drawing practice is maintained, although for coarse hanks from heavy deniers, the top roller weights may be increased.

In utilising existing equipment it is practical and economical to produce carpet yarns of 0·9s c.c. to 3s c.c. on the speed frames. On standard frames two lines of drafting rollers are used and selvedge condensers are recommended. The high bulk of the rovings will require appropriate alterations to the lifter and ratchet wheels. Spinning can be accomplished in one of several methods:—

(1) On the roving frame from double slubbing.
(2) On the intermediate from double slubbing.
(3) On the can-fed intermediate.
(4) On the roving frame from double intermediates prepared in turn from double slubbings.

Methods 2 and 3 are considered more economical, as the larger intermediate bobbins require fewer doffings and produce longer lengths.

The folding and winding of tufted carpet yarns is important as the tufted carpet manufacturers require large knotless packages. Latex piecings are therefore used and care must be taken to ensure a small uniform join. It is possible to fold coned yarn to 4-lb. packages on a machine such as the 7-in. Arundel doubler. An 8-lb. cone can then be produced involving only one latex piecing and providing a satisfactory package for the carpet tufter.

Application of Man-Made Fibres to Carpets

By J. A. KIRBY, M.SC.(TECH.)

IN this country a genuine and growing interest has been shown during the past ten years in the possibility of constructing carpets with a pile composed of man-made fibres alone, or in blend with wool, and much of the early reluctance to use such fibres had been replaced by a critical acceptance that these fibres have a place in pile yarns. Much experimental work is now taking place to find the correct application of these fibres according to the particular requirements they must fulfil in the finished carpet. The main question that must be answered by all interested parties in such experimental work is "What sort of yarn shall I use?" This usually means: "What blend or yarn composition will best suit my purpose?"

The replacement of wool carpet pile yarns needs careful thought because the wool has been adequate in general and the advantages of price have to be properly and carefully utilised. The question can be simplified by relating it to consideration of price, and most commercial developments are simplified somewhat by such a reference. Even so the answer must be obtained by trial and error methods. The properties of man-made fibre pile yarns are slowly being evaluated and understood. It is a little early yet but it appears probably that in the not too distant future it will be possible to make the choice among the many alternatives by relating specifiable performance characteristics to price.

Types of Blend Yarn

Blends of wool and "Fibro," mainly 50/50, are widely used for Axminster carpets. Some blends contain less than 50% of wool, but rarely of more than this proportion because the princial desire is to reduce the price of the yarn as much as possible. 18·0 den. 4 ins. staple matt "Fibro" is the established man-made fibre for this yarn, although the 15·0 den. 4 ins. matt crimp "Fibro" now available is likely to take its place because it has better characteristics.

There are two ways of using cheaper yarns (man-made fibre blends are usually cheaper than all-wool yarn) and both are employed. The usual practice is to make cheaper carpets by taking the full direct benefit from the lower price of the yarn. The other method is to make a better carpet without lowering the carpet price, or by lowering it only a little. Unfortunately, the latter way has not been exploited enough probably because it might not bring about an expansion of total carpet sales. It is our belief that the latter may well prevail in time because by increasing the weight of pile in a carpet by using coarser yarn a much better carpet is possible. Where it is desirable to make a carpet surface as near to all-wool as possible, a blend of 50% "Fibrolane BX," 18·0 den. 4 ins. staple 50% wool can be used but this blend is slightly more expensive than the 50/50 "Fibro"/wool blend.

A series of experiments have commenced with a new type of blend carpet yarn which is a further development of the principal of improving the quality of the carpet without increasing its cost. These experiments make use of the property of nylon staple to increase the wear resistance of textiles even when they form a minor proportion of the blend. The extra cost of the nylon staple compared with wool is balanced by incorporating "Fibrolane" in the blend. Examples of such blends are 2/3 "Fibrolane BX" 18·0 den. 4 ins. staple, 1/6 nylon, 1/6 wool, which is appreciably cheaper than all-wool, and 40% "Fibrolane" 18·0 den. 4 ins. staple, 20% nylon, 40% wool, which is slightly cheaper than all-wool.

Blend yarns which comprise "Fibro," "Fibrolane," and wool, are particularly promising as such blends can be slightly cheaper than 50/50 "Fibro"/wool blends say, and the fibres appear to combine together rather well. Laboratory tests show that Axminster carpets made from such blends will have a good wear life and are similar to wool in softness and resiliency and have the appearance of all-wool. Such

Representing machinery manufacturers at the symposium were l. to r. Mr. H. D. Winter (British Northrop Loom Co.), Mr. A. M. Pringle (British Tufting Machinery), Mr. I. S. Porter (Wilson and Longbottom Ltd.) and Mr. J. Marsden (Wm. Dickinson and Sons)

blends are in everyday commercial use in conventional carpets, but not yet in tufted carpets.

"Fibro"/"Fibrolane" Blends

Many conventional carpets have been made with these blends and some very good carpets have been made. One example incorporating such a yarn is a Wilton carpet constructed according to the principle of upgrading by using larger weights of pile of a cheap yarn, then would normally be used in an all-wool pile carpet. The composition of the yarn is:—

40% "Fibrolane BX" 18·0 den. 4 ins. staple stock-dyed.
20% "Fibro" matt 50·0 den. 4 ins. staple stock-dyed.
20% "Fibro" matt crimp 15·0 den. 4 ins. staple stock-dyed.
20% "Fibro" matt crimp 4·5 den. 2 ins. staple stock-dyed.

The carpet is woven with 3¼ lbs. of yarn/sq. yd. of finished carpet, using a 2/45 yds./oz. woollen spun. This carpet has a very high abrasion resistance and resiliency, equal to an all-wool carpet. which is not lost even after it has become fatigued in the testing. Though this carpet exceeds the quality and performance that would be necessary for household use (it has been made for office use), it shows that high quality non-wool carpets can be made by using a large amount of relatively cheap yarn without necessarily increasing the cost of the carpet.

This blend illustrates the use of several fibres of different denier, the coarser ones to stiffen the pile, the finer ones to increase cover. Although it may be more trouble to blend fibres in this way (though one never hesitates to do this when using natural fibres) than to use only one, the advantages lie mainly with the blend particularly in woollen-spun yarns and particularly where specially crimped "Fibro" is not used. Such multi-denier blends are mainly used in 100% man-made fibre yarns as the natural variability in the wool is usually considered to be sufficient.

The pros and cons of single fibre blends versus multi-fibre blends have never been clearly settled as far as we know. In the case of blend yarns for tufted carpets where the variation of the denier is much less than in the above example, and where crimped "Fibro" yarns are to be preferred. "Fibrolane" is a soft, warm handling fibre of good resilience, and having good covering power, and is being increasingly used in the trade in blend with "Fibro."

"Fibro" yarns come last in this series in spite of the extreme importance, merely because we chose to start our discussion with wool-containing yarns. From our point of view they are the most important class. They are the cheapest pile yarns (excluding jute) and therefore can be most attractive to develop. They can be simple yarns in construction and therefore simple to make and repeat. They can be coloured by the "Duracol" process, with great durability of colour at low price. They are very hard wearing.

For conventional carpets all "Fibro" yarns have been entirely used commercially to make low-priced carpets, never to make medium to high quality carpets of moderate cost, and it is largely for this reason that all-"Fibre" carpets have not always been successful. We have made some excellent all-"Fibro" carpets of high durability by taking advantage of the low price of the yarn to make high density pile carpets, and it is chiefly with this type of carpet that comparison between "Fibro" and all-wool can be fairly made. However, because of the high quality of such yarns, in relation to their low cost, all-"Fibro" carpet pile yarns are in wide use for low-priced conventional carpets mainly of Axminster construction.

Some of these are multi-denier blends and moreover are often spun on flax or jute systems. These systems produce yarns which are leaner than yarns produced on the cotton or woollen systems, but if such yarns are spun from crimped "Fibro" and are dyed in hank under a minimum of tension they can be appreciably bulked and then become comparable in covering power to yarns spun on other systems. Such yarns are low in price, because of the lower cost of conversion on flax and jute systems and have the further advantage of containing fewer short fibres and therefore being less liable to "linting" after cutting.

For conventional carpet pile yarns spun on the flax or jute system, the blends similar to the following one have been much used:—

25% 50·0 den. 6 ins. staple matt "Fibro."
50% 18·0 den. 6 ins. staple matt "Fibro."
25% 8·0 den. 6 ins. staple matt "Fibro."

Alternatively, 15·0 den. 6 ins. staple matt crimp "Fibro" could be used with advantage in place of 18·0 den. non-crimped "Fibro." It is customary to use a 2/40s–42s in place of 2/50s all wool, to allow for the lower covering power of such yarns as it must be remembered that viscose has a density of 1·5 (approx.) as compared with 1·3 (approx.) in the case of wool.

Tufted Carpet Yarns

Tufted carpets have become large users of all-"Fibro" yarns. The bulk of these are cotton-spun though flax-spun yarns are also in steady use. Here the use of multi-denier yarns has been very much limited because of the difficulties of repeatable blending for the exacting requirements of pale shades. Such blending that has been done has mainly consisted of dual blends of 15·0 and 8·0 dens., and there the 8 den. has been much used because it was of smooth cross-section whereas the 15·0 den. was crimped.

Recent developments have shown us that a yarn of 12·0 den. crimped "Fibro" is preferable to this blend in performance in carpet pile, as well as eliminating dangers of irregular blending. Many blends are in use for tufted carpets, e.g. "Fibrolane"/"Fibro," "Fibro"/wool to mention two, and it is possible that there will be considerable exploration of blends for tufted pile yarns as time goes on. In the meantime 100% matt crimp "Fibro" 15·0 den. holds chief place for this use.

We are seeing promising results from the treatment of crimped "Fibro" yarns by caustic solutions. When crimped "Fibro" yarns are treated in caustic soda of moderate strengths the crimp retracts strongly, making the yarns become firmer, and the fibres become set. This is utilised in one case by giving the tufted carpet a short treatment with caustic solution. The tufts of yarn shrink and bulk, and the pile is consolidated. The surface of the carpet is improved in appearance, and the resilience and firmness are greatly improved. Our work in this direction is still proceeding, but the results so far achieved lead us to think that tufted carpets produced in this way have a very promising future. This process probably lends itself to the production of non-crush all-viscose carpets.

Bulky Spun Yarns

Jute spun "Fibro" yarns are lean as spun but are used direct in tufted carpets in spite of this. Where piece-dyeing of tufted carpets takes place, the relaxation of the yarn in the hot liquors is accompanied by a bulking of the yarn particularly when the yarn incorporates crimp "Fibro." When such yarns are dyed for Axminster carpets the bulking takes place in the process of scouring or dyeing. Considerable bulking of such yarns is possible on a small scale where the bulking is assisted by the use of crimp "Fibro," and it is not reversed by the employment of tensions during processing, which will stretch the yarns when wet and reduce the bulking.

Kinky or curly yarns composed of all-wool or "Fibro"/wool are in common use for non-crush carpets. Recent experiments with 50% "Fibro," 50% "Fibrolane," jute spun, have been aimed at producing pile which has some of the properties of such kinky yarns. Carpets are substantially non-crush and hard wearing and cheap and have a pleasant appearance but may lack full resistance to uncurling or washing possessed by existing yarns when used as cut-pile. One example of such a yarn is:—

2/45 yds. oz. 6 t.p.i. 's,' 6 t.p.i. 's' single twist, 4 t.p.i. 's' folding twist, composed—
25% 30·0 den. 6 ins. staple "Fibrolane BX."
25% 9·0 den. 6 ins. staple "Fibrolane BX."
50% matt crimp "Fibro."

"Retractible" Yarns

One of the properties of "Courlene" continuous filament yarns is that they are capable of shrinkage up to 50% of their original length on heating. When these yarns are combined with yarns of normal shrinkage and such yarns are woven or tufted to make a carpet pile, interesting decorative effects are obtained when the pile is heated during the usual steaming processes, particularly when irregular or slub yarns are used as the standard component. This offers a means of developing random pattern effects in tufted or plain Wilton carpets.

Recent developments in the production of speciality continuous viscose filament yarns have led to the production of heavy denier yarns suitable for pile yarns in furnishings and probably in carpets. These yarns are known as bulky viscose yarns, as they are capable of bulking in hot wet processing due to displacement of the filaments. Such yarns produce a lint-free pile, good cover and can be produced with long lengths of yarn per package.

Another type of continuous filament yarn is being tried in this country, and is already reputed to have achieved some success overseas. This is a heavy denier continuous filament acetate yarn, which is bulked ("puffed") by treatment in air jets. Such yarns can be obtained in brilliant colours and possess high bulk, good covering power, and good resilience.

During the last two years the use of "Fibro" as chain warps revived and appreciable quantities are again being used, particularly in Axminster carpets. In the U.S.A. strong continuous filament rayon is in steady use for the same purpose, and "Tenasco" continuous filament yarn is being introduced here.

Soiling of Carpets

It is now well established that the principal cause of initial soiling is due to

contamination of the pile with oils, which, readily attract and retain soil. The oils are usually absorbed by the pile from the jute yarns in the base of the fibre, whether woven or tufted. The prevention of rapid initial soiling can be achieved by using backing cloths or yarns having a very low oil content (i.e. 1%). This problem has been fairly well tackled in the manufacture of tufted carpets but not so in the case of conventional carpets, though the need to do so is great here as backing yarns commonly hold a substantial quantity of oil, and there is no chance of diminishing the defect as long as such yarns are used. Our studies lead us to believe that when "Fibro," or "Fibro"/"Fibrolane" carpets are made with oil-free pile yarns woven into low oil content backing their rate of apparent initial soiling is similar to that of wool carpets.

The depth of the colour of the pile has a large effect on its apparent soiling. Pastel colours appear to soil rapidly dark colours not at all. This aspect of apparent soiling has been studied by our colleagues in the Bocking Research Laboratory, who have classified a wide range of colours according to their liability to show soil. The natural colour of most carpet wools is already sufficiently off-white to place them without their being coloured into a medium order of liability to show soiling, whereas "Fibro" and "Fibrolane" are naturally so white as to place them and pale colours dyed on them into a group liable to show soil. Unfortunately much of the demand for tufted carpets at present is for carpets of bright pastel colours. Where possible pastel colours should be avoided or sold with care.

There is a good deal of evidence to show that smooth cross-section fibre show somewhat better resistance to soiling than fibres which have non-smooth surfaces. There is also evidence to show that lustrous viscose fibres show apparent soiling more markedly than dull viscose fibres, for optical reasons, hence the use of dull or semi-dull "Fibro" or "Fibrolane."

One of the chief causes of loss of appearance in carpets is flattening and felting of the pile. This has been closely studied by our research laboratory at Bocking where instruments have been devised to measure this property also a technique which can give a good indication of what sort of performance a pile will have in this respect. Results of many tests, supported by actual wear, have shown that this flattening occurs particularly rapidly in carpets in which the quantity of the pile yarn is low, and one way to minimise this defect is to increase the density of the unworn pile as much as possible.

Wool has a high natural resiliency, which permits low density pile carpets to be tolerable for a limited time, but as many man-made fibres do not possess resiliency to the same degree it is necessary to compensate for this lower resiliency by increasing the unworn pile density above that common for wool carpets. This can be done quite readily because of the lower price of man-made fibre yarns, but the demand for cheaper and cheaper carpets has reacted against this in very many cases. Where higher weights of pile have been employed in tufted carpets the pile has been deployed to increase pile depth instead of to increase pile density. German manufacturers have exploited this knowledge of effect on pile density more than we have in this country.

Resistance to wear, in the sense of wearing away of the pile as distinct from loss of appearance is a topic which appears to interest manufacturers mainly in marginal instances, such as in lower quality carpets, or carpets used to cover stairs. Generally speaking the wearability of carpets is felt to be adequate. It is well known that it is related to pile weight and carpet construction and ,therefore, to price, and adequate wearability can always be obtained when required by attending to these factors.

We have given a lot of attention to this aspect of carpet behaviour because it is essential for us to ensure that any changes we wish to support lead to carpets that wear at least as well as wool carpets, though, more particularly, there is much advantage in increasing wear life when it is not gained expensively. This is where man-made fibres can play a useful part. The Bocking research laboratory has developed abrasion testing machines and methods, which we have good reason to believe will give satisfactory indications of the wear-life of carpets. The principal observations so far made in this work is to confirm the well known fact that there is a great dependance of wear on the weight of pile in the carpet.

The "T" values probably relate to the intrinsic wearability of the fibres, coupled with the efficiency in which they are deployed in the construction of the carpet. From the large number of tests made at Bocking the following mean "T" values have been obtained.

Pile "Fibro"	Carpet Type	Mean "T" Value
"Fibro"	woven cord	3
	woven cut pile	2
	tufted	1·5
Wool	woven haircord	2·5
	woven cut pile	1·5
"Fibro"/wool	woven cord	3
	woven cut pile	1·5
"Fibrolane"/"Fibro"/wool	woven cut pile	2
Wool/"Fibrolane" blend	woven cut pile	1·5

These figures indicate that "Fibro" wears somewhat better than wool, "Fibrolane" about equal to wool. The difference between the fibres are small compared with the effect of pile weight.

Variations in "T" value occur for a given material dependent to some extent on the quality of the fibre, for instance how much it has been damaged; and on the efficiency with which it is used in the carpet (long, not so dense pile, wears worse than shorter dense pile in general). The actual structure of the whole carpet appears to play its part. The full understanding of "T" value in this equation, however, must await on more detailed study of this factor. It is sufficient for our present purpose to note that among the different fibres, given above, it would follow that where high wear life is sought at a low price it is better to employ larger weights of "Fibro" or "Fibrolane" than to use wool.

Physical Properties of Tufted Carpets of Viscose and Nylon*

By C. H. STURLEY, B.SC.†

ONE of the most important reasons for laboratory testing of textiles was to forecast probable performance in particular uses. For carpets, it was therefore, advisable to make tests on both new specimens and on specimens after various stages of use in actual floor trials and wherever possible to compare laboratory test results with performance in use. However, it is well known that carpets can be subjected to very different conditions in actual wear, according to their particular location, and comparisons between carpets may have to be referred to a particular type or types of use. Physical properties of tufted carpets will depend on

(1) The fibre or fibres used in the pile yarn;
(2) Construction of the pile, including yarn construction;
(3) Properties of the backing.

B.N.S. Ltd. are making a systematic investigation of composition and construction variables. A large proportion of the yarn used in the manufacture of tufted carpets in this country is staple viscose rayon. Accordingly, it was decided initially to investigate the physical properties of viscose nylon blends, 100% viscose and 100% nylon in tufted carpets of commercially similar constructions in order to assess what advantages could be gained by the use of nylon 6·6.

Compositions of tufted carpets examined to date are 100% staple viscose and staple blends of viscose and nylon containing 10, 15 and 20% nylon, respectively. The carpets which were of cut pile in a plain unpatterned construction were laid in busy corridors and their physical properties assessed by tests on new specimens and on specimens after various stages of use.

It was found that blending nylon with viscose resulted in a considerable increase in abrasion resistance and better retention of resilience and thickness in use. Inclusion of 20% nylon with viscose was found to increase the wear life—as assessed by laboratory tests and user trials—by a factor of at least 5. As a result of the better retention of resilience and thickness, carpets containing nylon 6·6 provided more cushioning and retained their tufted appearance in use better than the 100% viscose carpet.

Washing improved the resilience and

* *From a paper given to the one-day conference held recently at the British Rayon Research Association.*
† *British Nylon Spinners Ltd.*

increased the thickness of all used carpets but the thickness expressed as a percentage of that for new carpets and resilience was again greater for the blends than for the 100% viscose carpet after considerable use. Inclusion of nylon 6·6 with viscose resulted in a softer more pleasing handle. Soiling in use tended to be less for carpets containing nylon 6·6 than for the 100% viscose carpet. This result may have been influenced by differences in pile yarn construction, although the yarns used were all commercially available types.

The tufted carpets examined were manufactured under production conditions from 100% viscose staple and viscose/nylon staple blends containing 10, 15, and 20% nylon, respectively. Carpet constructions were as similar as possible. The backing cloth used was a standard 2×2 broken twill weave, 12 oz./sq. yd. jute fabric and application of latex to bond the tufts to this amounted to 14 oz./sq. yd. based on dry weight of the latex. Normal viscose having the usual irregular cross-sectional shape was used.

Laboratory tests were made on carpet specimens both before and after various stages of use, all tests being carried out in an atmosphere of $67 \pm 2\%$ R.H. at $70 \pm 4°$F. As these were the first carpets examined, test methods were discussed at the outset with other organisations (Courtaulds Ltd. and Wool Industries Research Association) who have had considerable experience in carpet testing. In order to carry out this work, it was necessary to use readily available apparatus. However, use of conventional carpet testing equipment subsequently obtained, had led to similar conclusions on physical properties to those given here.

The carpets were laid in two busy thoroughfares, one being an entrance corridor to an office block and the other an entrance corridor to a laboratory (henceforward referred to as User Trials 1 and 2, respectively). Both carpets were subjected to a heavy traffic (600 to 800 people per day) and to considerable quantities of dirt and dust. User Trial 1 was sited immediately inside a building entrance, so that in inclement weather, the carpets were subjected to wet foot imprints, whereas for User Trial 2, sited indoors remote from the entrance, the conditions were relatively dry and the atmosphere was controlled. Both user trial carpets were laid on a horizontal surface on top of a felt underlay and were vacuum cleaned once per day. The numbers of people walking over the carpets were automatically recorded using B.T.H. photo-electric relay units and electromagnetic counters.

Single yarns were used in production of all the carpets. Nylon was present as heat set 18 denier 2½ ins. staple of medium crimp. Differences in construction between carpets were mostly minor and were no greater than could be reasonably expected for commercial production. The viscose was spun to a coarser count, but with lower fibre deniers than the nylon. Differences in handle were readily detected, the 100% viscose carpet being "dead" and hard in comparison with the carpet containing nylon.

Due to the hard "dead" handle of the 100% viscose carpet, it might be expected that a difference in resilience would be detected between the new carpets. In fact, under the conditions of loading used this was not the case and resilience of all the carpets when new, was similar. All carpets showed a relatively rapid decrease in resilience during the initial stages of use followed by a less rapid decrease during subsequent wear. The resilience of the 100% viscose carpet in use became lower than for the blended carpets. For viscose/nylon blends resilience was numerically greater, the greater the percentage of nylon in the carpet. Washing improved resilience of all used carpets, but the order of ranking of the carpets was unaltered.

The behaviour of the 100% viscose carpet in comparison with the blended carpets was also confirmed by thickness measurements and by appearance after use. The viscose carpet quickly bedded down into a compact mass and lost its tufted appearance. Carpets containing nylon retained their tufted appearance much better than the 100% viscose carpet.

Loss in thickness during use showed that the trend for change in thickness during use was similar to change in resilience, namely, a relatively rapid decrease in thickness during the early stages of use followed by a less rapid decrease in thickness during subsequent use. Increase in nylon content did not always result in a smaller decrease in percentage thickness at all stages of use but the 100% viscose carpet always showed the most decrease in thickness after considerable use. Washing, as expected, increased the thickness of all the carpets and the 100% viscose carpet again showed the greatest decrease in thickness after considerable use.

There are many difficulties in interpreting laboratory tests for abrasion resistance and in correlating test results with actual wear. The relative abrasion resistance of different carpets assessed by a particular type of laboratory test and its comparison with the relative abrasion resistance in actual use will depend on several factors which could include:—

(1) The actual level of abrasion resistance.
(2) Fibre properties other than abrasion resistance.
(3) Type of wear in use.

In the case of (1) it is logical to expect that, because of the very high rates of wear in the laboratory test employed, relative differences between fibres may tend to be greater when assessed in the laboratory than is actually the case in use. The greater the "true" difference, the more pronounced this effect would be expected to be.

The recovery of fibres after compression of the pile is an example of (2). In use, there is usually a relatively long average time between footsteps falling on the same place on the carpet and the fibres have time to recover. Often in laboratory tests, the whole specimen is always under pressure or the time interval between successive applications of load is relatively small. Thus, it is likely that all fibres will receive more rubbing when they are bent over—with consequent fibre breakage—than is the case in use. This means that fibres of good recovery may tend to be ranked lower for relative abrasion resistance in laboratory carpet abrasion tests, than in actual use.

Carpets, in use, can be subjected to different types of wear in varying degrees of severity. Thus, a stair carpet will receive a different type of wear to a lounge carpet and it will almost certainly be a more severe wear. Relative abrasion resistance of carpets could very well be different for the different types of use.

Representing British Nylon Spinners at the symposium were, l. to r. Mr. J. F. Tomkins, Mr. W. T. Westhead, Mr. C. H. Sturley (all from Pontypool), Mr. G. Farrington (Manchester) Mr. A. Cooper (Doncaster) and Dr. P. Hatfield (Pontypool)

The 100% viscose carpet showed a linear relation between loss in weight and number of rubs from the commencement of testing up to the end point. The same straight line was followed for both used and used and washed carpets, but the number of rubbing cycles to end point was less for the washed specimens. For the blended carpets, the used and used and washed specimens did not follow the same curves when loss in weight was plotted against the number of rubbing cycles. The curves for these carpets were approximately linear at lower number of rubs, then there was gradual change in slope giving a smaller rate of loss in weight at higher numbers of rubs (ignoring the "soil removal effect" close to the end point of used specimens). In other words, the rate of wear of the blended carpets decreased as wear proceeded. This effect was due no doubt to the difference in percentage viscose and nylon in a blend and to the relative difference in abrasion resistance of the component fibres. Thus, initially there would be a more rapid removal of viscose in abrasive wear due to it being the major component; also there would be a more rapid removal of viscose due to its lower abrasion resistance. In laboratory tests after high numbers of rubbing cycles as the end point was approached it was noted that the remaining fibre was almost entirely nylon.

The weight losses at the end points were different for the various carpets. For new specimens, the end point weight losses for the blended carpets decreased with the increase of nylon content. For the 100% viscose carpet, the weight loss at the end

point was similar to that for the carpet containing 15% nylon. For used specimens tested on the abrasion machine, this order was not always maintained.

An attempt was made to correlate test results on the abrasion machine with wear in use. For this purpose, the 100% viscose and 80% viscose/20% nylon carpets only were considered. One square of approximately 2 ins. side of each carpet was cut after each stage of use, care being taken to include the same number of rows of tufts in needle and stitch direction for each specimen. The specimens were thoroughly washed individually. They were then dried and conditioned to equilibrium weights in the laboratory atmosphere. These weights were noted. The pile was shaved off completely down to the backing with a razor blade and the backing and the yarn embedded in it weighed. The difference between the two weights gave the weight of the pile. Similar measurements were made on new unwashed specimens of the carpets and the decrease in weight of the pile calculated for the used washed specimens.

The validity of this approach will depend among other factors on whether an appreciable weight loss occurs on washing new carpet specimens. Tests were made to investigate this and it was found that on washing new specimens the weight losses were less than 4 mg. for a carpet area equal to a circle of 1 in. dia. This is less than the weight loss in the very early stages of actual wear and no appreciable error should, therefore, result from this cause.

In order to correlate traffic with number of rubbing cycles it was necessary to use a different relation between the scales for these two variables for the 100% viscose carpet and the carpet containing 20% nylon. For a traffic of 131,000—the maximum to which the carpets were subjected—the loss in weight was 82 mgs. for the 80% viscose/20% nylon carpet and 184 mgs. for the 100% viscose carpet, thus showing the superior abrasion resistance of carpets containing nylon. 1,000 rubbing cycles in the laboratory abrasion test are shown to produce the same weight loss as traffics of 96,000 and 78,000 people for the 100% viscose and the 80% viscose/20% nylon carpets, respectively.

This indicated that the relative difference in abrasion resistance of the carpets in use is somewhat less than in abrasion tests. Thus, assuming that the same relation between traffic and number of rubs is maintained in subsequent wear, the ratio of the wear lives of the carpets would be 5·4 : 1 instead of 6·7 : 1 as predicted by number of rubs to end point in laboratory abrasion tests on new carpets. Also, again assuming that the relation between number of rubs and traffic holds throughout the life of the carpets, the total wear lives in traffic can be obtained from the number of rubs to end point for new carpets.

On this basis the 100% viscose carpet would withstand a traffic of 288,000 people and the 80% viscose/20% nylon carpet would withstand a traffic of 1,560,000 people. Assuming a traffic of 1,000 per day this would mean a wear life of less than one year for the 100% viscose carpet and a wear life of over 4 years for the 80% viscose/20% nylon carpet. In normal use in the home the wear lives would, of course, be very much longer.

Use of Vinylic Fibres in the Carpet Industry*

By C. FROGER†

FIBRAVYL is a staple fibre with a high tensile strength of the order of 3 gr./den. which has the ability to shrink in its loose state 55% at temperatures above 75°C. Thermovyl is also a staple fibre which has, however, been heat stabilised by treatment at boiling temperature. Its shrinkage is therefore nil at 100°C. Its tensile strength is only approximately 1 gram/den., and its appearance is less lustrous, resembling very much pure wool.

The regulations in force in France for official non-flame tests differed considerably from those specified in Great Britain and the U.S. In the latter two countries, one measured—on a specimen sample—the speed at which a flame propagated itself, whilst the French test regulations stipulated that the fabric should not propagate and assist the fire at all but should, in fact, resist its spreading. It is therefore necessary to make a proper, extended combustion test and to assess the resulting destruction of the fabric. The test should consist of submitting a sample of the material in question, measuring 28 cm. × 21 cm. (7 ins. × 4 ins.) and fixed by pins on a frame, to combustion by an alcohol flame for three minutes.

For public gathering places (theatres, cinemas, etc.) only articles said to be "difficult to burn" can be used, whilst "non-inflammable" fabrics have to be employed in, e.g. aircraft manufacture.

For carpet with P.V.C pile, the details are as follows:—

Warp for the back: Jute metric count 4/2.
Weft for the back: Jute metric count 3.
Binding warp: Cotton metric count 17/3.
Warp for the pile: Thermovyl, 50% 15 den., 50% 8 den., metric count 6/2.
Number of loops per metre: 345.
Fibres used were stock dyed.

This carpet has stood up particularly well to wearing tests, and when using the Schopper abrasion test instrument, with 1,000 grams pressure, the back showed only after 22,100 rubs. A pure wool carpet with the same construction under the same conditions only lasted 10,000 rubs. The addition of "Fibro" to the wool appreciably increased it's abrasion resistance, as it required 17,300 to 18,500 rubs on the abrasion instrument to obtain complete wear.

The best results were obtained by using a blend of 50% Thermovyl and 50% "Fibro."

Composition of the blend:

Thermovyl	15 den. ..	25 part
"	8 den. ..	25 part
"Fibro"	18 den. ..	30 part
"	4·5 den...	20 part

for which the abrasion tests required 26,800 and 31,500 rubs before the back appeared.

The carpet with Thermovyl pile only cannot be used for fitting out of aircraft, etc., as it is only classed as "hard to inflame" whilst the security regulation stipulates for this purpose "non-inflammable" material. We have had to study an 100% P.V.C. carpet.

Accepted and used by one of the great French shipping lines was an un-cut loop-pile fabric with the following construction.

Warp for the pile: 100% Thermovyl 15 den. 6/7 cm. (2½-3 ins.) staple. Dope-dyed, metric count 6/2.
Warp and weft for the back: 100% Fibravyl, mc. 6/2.
Binding warp: 100% Fibravyl, mc. 17/3.

The use of Fribravyl for this type of carpet was not conditioned by its shrinking properties but in order to obtain reinforcement yarns of sufficiently high strength. Apart from its complete non-inflammability (the carbonised surface during test does not exceed 54 sq. cm.), this carpet can be easily cleaned and its resistance to sea-air and sea-water is excellent. When subjected to a sufficient temperature above 75°C. Fibravyl has the power to shrink in its free state to approximately 55% of its original length. This very interesting feature can be used to advantage in order to obtain fancy effects on the pile, for making the pile denser by shrinking the back, or to create a novel carpet.

The Americans are particularly fond of the so-called relief pile carpet and when one considers that the U.K. has such a splendid carpet industry with practically every home in the country using carpets it is obvious that such a type of carpet should also be of very great interest here. These are "pile fabric" where one adds a relief effect by creating a difference in the height of the pile in order to break down the uniformity of the whole carpet.

The use of Fibravyl permits the manufacture of this type of carpet on a most economical basis. This novel technique consists in making use of a pile consisting of blended yarns containing 15-30% Fibravyl and the balance wool, "Fibro" or a mixture of the two, and passing the carpet over a heated calender roller on which the pattern appears in negative. When in contact with a heated surface the Fibravyl shrinks, carrying with it the other fibres with which it is blended. In this way, the design is "embossed" on the carpet.

* *From a paper given at the one day conference held recently at British Rayon Research Association.*

† *Societe Rhovyl, Tronville-en-Barrois, France.*

Modern Worsted Drawing and Spinning

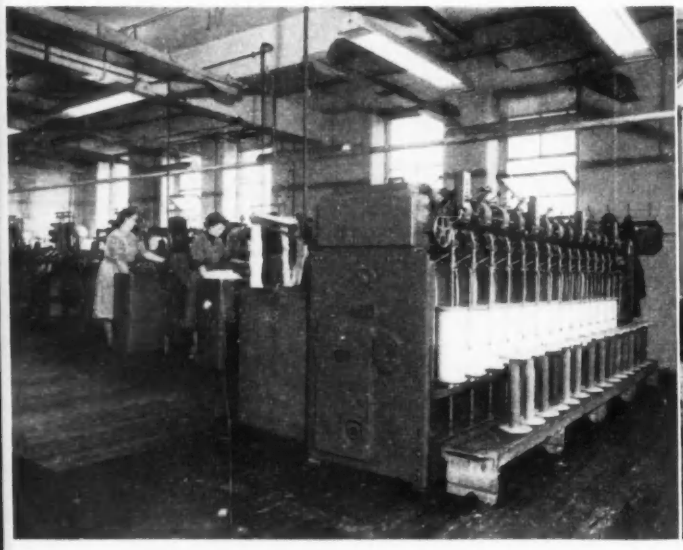
Details of a new installation of the latest P.S.S. worsted drawing and spinning machinery in a well-known company of knitwear manufacturers

THE name of "Wolsey" is synonymous with quality, and wherever high class knitwear of all kinds is retailed, "Wolsey" products are found. At the Broad Lane Mills, Bramley, interesting developments have recently occurred and one section of the plant has been completely modernised. Wolsey Ltd. decided, after making careful investigation and conducting exhaustive tests, to install the latest worsted drawing and spinning machinery made by Prince-Smith and Stells Ltd., Keighley.

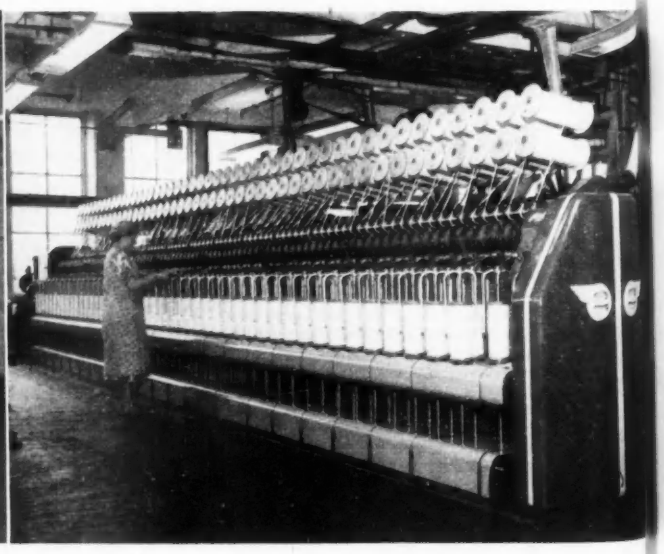
In order to make way for the new machinery, open drawing machines were taken out; the machinery being replaced comprising two double can open gills; two 2-spindle gills; one 4-spindle draw box; one 6-spindle draw box; two 10-spindle drawing finishers; 130 spindles-reducers. Incidentally, five operatives have been required to operate the above drawing plant.

The decision was taken to install a three operation set of drawing, the first two operations with Raper "Autolevellers" which, it was estimated, would produce about twice as much as the original open drawing machinery. In the event, the production estimate has been handsomely exceeded in the "new Bradford system" drawing set.

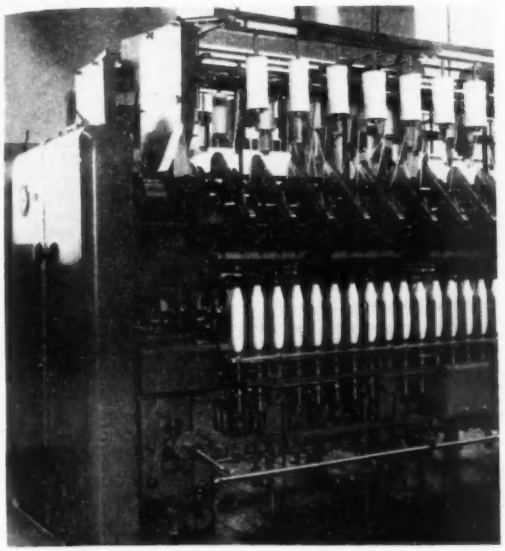
The company make blends of pure wool, also wool/nylon, and precede their drawing machines with three open mixing gills (double can machines), i.e., one mixing operation, prior to processing through the Raper "Autoleveller" intersecting gill boxes. Two "Autoleveller" gills are used and these are followed by single end feed to a 14-spindle "Autoleveller" drawbox. The drawbox is followed by a 92-spindle M.S.2 cone reducer with roller drafting which produces a softly twisted roving suitable for spinning on the "Megaflex" ringframe (Model K.M.F.1—3¾ ins. pitch), fitted with "Versatex" apron high drafting and spinning on to a 11 ins. paper tube using a 2¾ ins. dia. ring. The M.S.2 cone reducer is run at a spindle speed of 900 r.p.m. The 10 ins. × 5 ins. bobbin produced by the M.S.2 cone reducer allows eight full doffs on the "Megaflex" ringframe before re-creeling is required, and on the final doff the bobbins are run out. Two 6 ozs. "Megaflex" cops fill one twister bobbin. The twisting frames which



Mixing gills, Raper "Autoleveller" gills (Model K.R.G.1) and Raper "Autoleveller" drawbox (Model K.R.D.1)

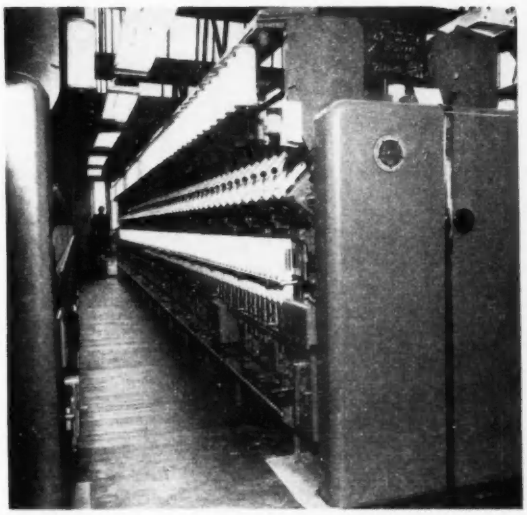


Cone reducers with roller drafting



(left) Spinning from French drawn rovings on the "Megaflex" ringframe, Model K.M.F.1

(right) "Megaflex" ringframes, Model K.M.F.1



follow the "Megaflex" frames are Prince-Smith and Stells two-fold ring trap twisters, Model K.T.T.1; pitch of spindles 4 ins., bobbin 9 ins. traverse with $2\frac{3}{8}$ in. bottom flange, $2\frac{1}{4}$ ins. top flange, $10\frac{1}{8}$ ins. overall length. The ring diameter is 3 ins. with self-lubricating rings $\frac{21}{32}$ in. deep.

At present Wolsey Ltd. have 2,360 "Megaflex" ring spindles installed at Broad Lane Mills, producing a wide range of counts and from various qualities for hosiery with an average efficiency stated to be 89%. Compared with the flyer doffer spinning frames which were formerly installed, production figures are very favourable. The floor space previously occupied by the flyer doffer spinning is now occupied by "Megaflex" ringframes, and from the same floor space with the new spinning frames, three times as much yarn is produced.

Versatility

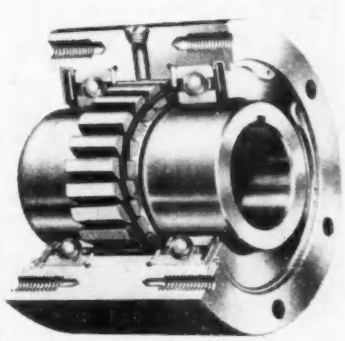
The "Megaflex" frame, Model K.M.F.1, fitted with "Versatex" apron high draft was specifically designed to take the softly twisted rovings from the M.S.2 cone reducer. Wolsey Ltd. have made numerous trials to test the capabilities of the machines and find that they can obtain an excellent spin with their French drawn twistless rovings. Although artificial humidification is often regarded as a necessity for dry combed materials, two years' experience has proved that it is possible to spin from French drawn twistless rovings under normal mill conditions on these "Megaflex" frames. Apart from a well-heated room, no artificial humidity is installed in the spinning room, the natural humidity of the district being sufficient. The "Megaflex" frames have also been found to be suitable to spin from rovings produced on dandy rovers from an open drawing set, when these rovings are made with slightly less twist than normal (e.g., $\frac{1}{2}$ t.p.i. less). Although this procedure is not normal or recommended as a rule, it does help to provide balance in the plant on occasions.

General Observations

Wolsey Ltd. confirm that the yarn produced from the "Megaflex" frames, following new Bradford system drawing (two "Autolevelling" operations and one cone reducing) is equal to Continental drawn/mule spun yarn. The yarn levelness is stated to be superior and the fulness of handle enhanced. This may be due to less stretching of the fibres in processing, but certainly the results achieved are entirely satisfactory. Savings have been made in so far as the conversion cost is concerned. Raper "Autoleveller" drawing shows a reduction in conversion cost compared with open drawing. The waste made on the open drawing set previously installed was only 1% which in itself is very low and due to working bulk lots, but with "Autoleveller" drawing even this has been reduced and the remarkable figure of $\frac{1}{2}$% waste in drawing is being achieved—a reduction of one half. Maximum advantage is to be taken of Raper "Autolevelling" and "Megaflex" spinning by operating the plant on a two-shift basis.

Features of the Sprag Clutch

ANOTHER product has been added to the range of power transmission accessories manufactured by Renold Chains Ltd., Wythenshawe. Known as the sprag clutch, there are more than 70 standard sizes available ranging from 50 lb./in. to 136,500 lb./ft. torque capacity and ·250 in. to 12·00 ins. bore size. The sprag clutch can be used as a free wheel, a one-way or "hold back" clutch, and as a means of indexing. The design allows for a full complement of sprags, thus giving high torque capacity combined with comparatively small size, and the firm point out that no backlash can develop throughout the working life of the clutch. In most cases the sprag clutch is supplied complete with sleeve or anti-friction bearings, thus eliminating the risk of mal-alignment and simplifying machine design.



Sprag clutches of this design, marketed in the U.S.A. for the past 13 years, have proved successful in a wide range of applications, including dual and multi-speed drives, stand-by drives, starters, conveyors and elevators, feed mechanisms, etc. Renold Chains Ltd. are licensed to manufacture sprag clutches by Formsprag Company, U.S.A., and will market them throughout the world (exception the U.S.A.). A catalogue giving full technical details is available on request.

New Four-Colour Automatic Blanket Loom

DESIGNED and engineered on modern lines with jig built standardised components which ensure that spare parts are readily interchangeable, the new four-colour automatic blanket loom announced by George Hattersley and Sons Ltd., Keighley, is offered in four different nominal reedspace, i.e. 90, 100, 110 and 120 ins., with speeds from 96 picks/min. in the widest reedspace up to 110 picks/min. in the 90 ins. reedspace loom. Ample time for the shuttle to pass through the warp shed is an essential feature in looms of these widths and this loom is fitted with eccentric driving wheels which give additional dwell at back centre. Shedding is by double series inside treading with a normal complement of four heald shafts suspended from overhead bowls in which are fitted "Reservoil" bushes to eliminate oiling. Since all other treading linkages are below the warp line, clean cloth is assured. The let-off motion is of the positive type—by pump rod—and special consideration has been given to the difficulties sometimes encountered in weaving the last cut on the beam when low picked cloths are being woven. The maximum warp beam flange diameter is 24 ins.

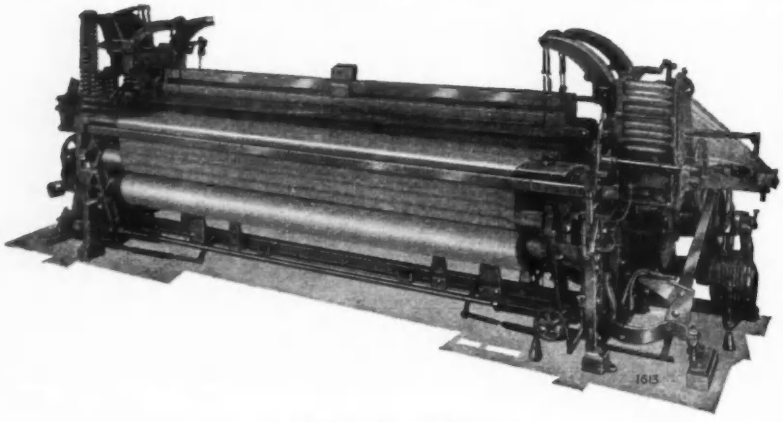
The take-up motion is both positive and continuous with reversing motion incorporated in the design. Change wheels are required, but to simplify calculation these are designed to give either one or two picks per inch per tooth. A choice of four different piece beam motions is offered, and the maximum cloth roll diameter is 16 ins. The simplified utility type with weights and chains is available, or alternatively friction drive by chain and sprocket or by gear wheels, or by spring pressure applied by handle, rack and pinion which raises and lowers the beam. The latter types are decidedly lighter to operate and easier for the weaver.

Single or twin centre weft-forks of the new patented micro setting type can be fitted. Case hardened standardised steel components and fine adjustment to the spring that activates the tippler are features in this new fork. When the weft breaks, the weft forks set in motion an automatic pick finder, which is a great help to the weaver in that the loom stops quite automatically with the broken pick in the open shed, with the shuttles correctly boxed, and the take-up and box indicating cylinder correctly adjusted. In addition, a "first pick protector" is incorporated so that the weft forks do not operate upon re-starting when there is no weft under the forks. The makers claim that these features make a box loom as simple to follow as a plain loom, and that loom efficiency is greatly increased.

The robustly designed box motion with steel drop forged components is the familiar vibrator and wheel type, and the steel shuttle box has the swellers at the front, reducing weft cutting. A simple anti-shuttle creeping device is built into the shuttle box. This feature is important in weaving bordered blankets where a shuttle may be required to rest for long periods.

Box indication is by wood lags and either wood or steel pegs. An optional extra is a lag saving device for use when weaving blankets with borders. It is quite simple to plan lag patterns. The box lag cylinder works in conjunction with a secondary or counting cylinder which can, at random, be made to multiply any given lag in the box chain by a predetermined number. There is practically no limitation to what this predetermined number may be, and so very lengthy chains can be reduced to more manageable lengths. The motion has been designed to work with the automatic pick finder and at no time is it necessary to make manual adjustment.

An electrical weft feeler is fitted, designed to contact a metal sleeve on the pirn and on registering an indication operates a solenoid; from then on the pirn change mechanism is entirely mechanical. The V-type battery has a capacity for 32 pirns, and a miniature box motion speeds up colour selection so that the pirn is released almost a full pick before the change takes place. Great attention has been paid to the control of the outgoing and incoming weft ends and elimination of weft trailing is achieved by a shuttle eye cutter and consecutive pick temple cutter, which is extremely effective when two pirns change in quick succession. As waste is an important consideration when using coarse yarns, larger the weft package is and lower the figure. With this loom the 10 ins. wood pirn has a capacity of 2¾ to 3 ozs. of weft; other smaller standard sizes are also available. Mechanical or electric warp stop motions are available and both are available as two-row or four-row.



Hattersley blanket loom

New Air Nozzles

TWO additional air nozzles for use with their Bullows-Binks Model 19 spray gun are announced by Alfred Bullows and Sons Ltd., Long Street, Walsall. The new nozzles are the 63PB and 67SA. For use on pressure feed, the 63PB, a Bullows Group 1 air nozzle, will operate with any of five material nozzles varying from ·040 in. bore to ·070 in. bore. It is stated to be suitable for spraying the normal range of finishing materials from thin spirit or water stains to primers and

heavy enamels. It is complementary to the 66 PE nozzle, and is claimed to give better results on certain materials.

A Bullows' Group 2 air nozzle, the 67SA operates with the 67 material nozzle of ·085 in. bore. It is designed for use with a syphon cup and is suitable for use with aeroplane dope, heavy primers, fillers and cement paint. Both nozzles are hard brass stampings with taper location on material nozzles to ensure permanent concentricity. All critical machining is done after plating.

New Mill for N. Ireland

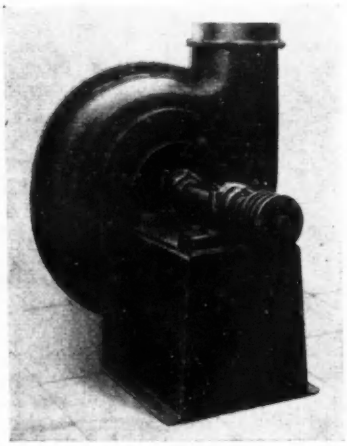
Lord Glentoran recently announced in the N. Ireland House of Commons that negotiations have been completed with Ira Ickringill and Co. Ltd., Bradford, to establish a factory in N. Ireland for spinning worsted yarns. It is to be erected at Armagh with an area of approximately 28,000 sq. ft. Some plant and machinery at present in the company's factory at Bradford will be transferred and re-erected at Armagh.

Hand Operated Hydraulic Elevator Truck

THE latest addition to the "Vertolifter" range of hand-operated hydraulic elevator trucks made by Powell and Co., Burry Port, Carms, S. Wales, incorporates a new size platform, 20 ins. long × 21 ins. wide and is available with two heights of lift, 4 ft. and 5 ft. With two other platform sizes of 19 ins. × 9½ ins. and 19 ins. × 15½ ins. and the two heights of lift indicated, there are now six models available in this range.

The firm emphasise that each model is robustly constructed using steel sections of adequate gauge and design for the load capacity of 500 lbs. All moving parts have either ball or roller bearings. The hydraulic pump is double acting and finger tip control permits the load to be lowered swiftly or slowly with instant stopping at any point.

The overall width of 23½ ins. is standard on all models, thus any model can be used in confined places and takes up little storage space. These elevator trucks are extremely useful for lifting and lowering cases, bales, sheets, machinery components, barrels, etc.



New Range of Moulded PVC Fans

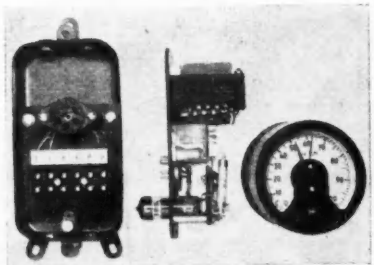
IN conjunction with Acalor (1948) Ltd., Sturtevant Engineering Co. Ltd., Southern House, Cannon Street, London, E.C.4, have produced a range of moulded PVC fans based on their original "Monogram" series. These fans, designed in particular to meet the ever growing need for exhausting corrosive fumes, have moulded casings and fully moulded PVC impeller which, it is stated, permit higher operating speeds and efficiencies than can be obtained with fabricated fans of this type. The high-grade steel fan shafts run in ball and roller bearings for minimum maintenance and a substantial steel fabricated base is provided to eliminate installation problems. The drive is by V-rope. These units are in addition to the wide range of equipment manufactured by both companies for handling corrosive fumes. No. 1 and No. 2 sizes are now available with larger sizes coming forward shortly. Full particulars are available from either company on request.

Electronic Humidstat

DEVELOPED to ensure accuracy and reliability under exacting conditions, the "Regeltron" humidistat is the visual control type, and is produced in a varied range of mountings to cover most applications. The instrument is supplied with a 3 or 4 ins. dial fitted with 1, 2, or 3 sets of non-corrosive potential contacts as required, and the manufacturers state that its accuracy is such that the R.H. differential is under 1%.

The humidity element is the hygroscopic type, the operative member being synthetic hair capable of giving accurate readings in its range of operation—10% to 100% R.H. It is claimed that the synthetic hair used in the sensitive element has two main advantages over human hair in that it will work efficiently in temperatures up to 220°F. and that it reacts to a change in conditions much quicker than human hair.

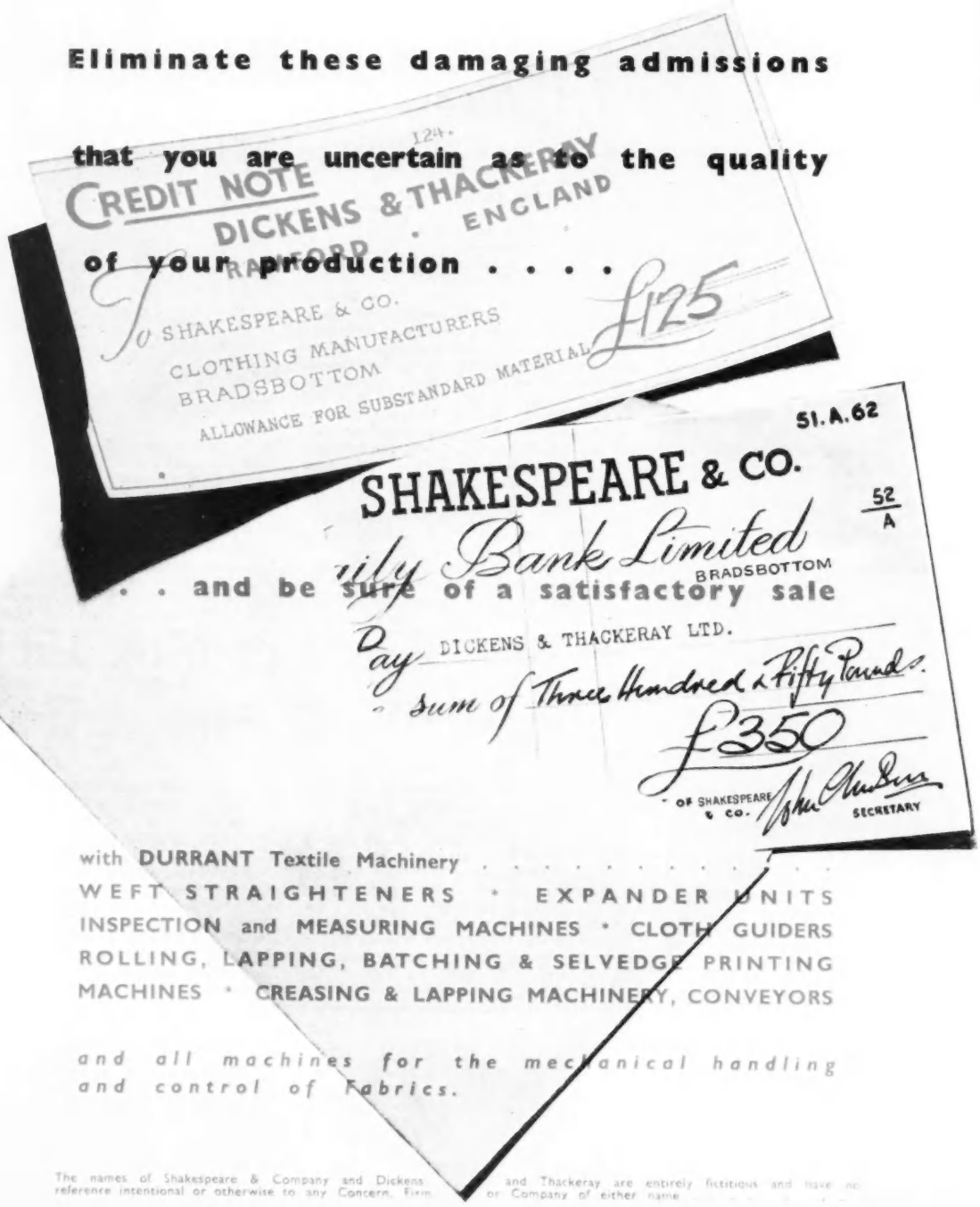
The relay is supplied as a single or multi-circuit unit to make or break on rise of humidity and operates on 110 v. or 200/250v. 40/50 cycles supply. The mode of action has eliminated the possibility of sparking, scorching, sticking or overloading of the contacts. Further information is available from Alexander and Tatham Ltd. (sole agents for Great Britain), Victoria Chambers, South Parade, Leeds 1.



The "Regeltron" humidistat electronic relay unit and control/indicator dial

Eliminate these damaging admissions

that you are uncertain as to the quality of your production . . . .



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Epoxy Resins Find a Place in Finishing Textile Materials

Epoxy resins appear likely to compete with urea- and melamine-formaldehyde resins in the resin finishing of textile materials and it will be interesting to follow the effects of this in the near future

By B. C. M. DORSET

FOR many years and, in fact, since the first use of resins for textile finishing about 1930, the thermosetting urea- and melamine-formaldehyde resins have been most used. These resins have the advantage of being white in colour, easily formed within the textile material with a minimum degree of fibre deterioration, and are highly effective for producing such desirable fabric characteristics as resistance to creasing and shrinkage, enhanced stiffness of handle when desired, water-fast lustre and embossed effects, and washfast weighting, etc. In recent years attention has been given to two or three other types of resin mostly with the idea of avoiding the use of formaldehyde or of securing a higher degree of molecular cross-linkage within cellulose fibres but, in spite of this, the urea- and melamine-formaldehyde resins still retain most favour among textile finishers.

A considerable number of different types of resin are known and employed in the plastics industry but they each have some disadvantage when considered for use in the textile industry. For example, the phenol-formaldehyde resins are cheap and readily available but they give rise to colour development under conditions to which textile goods are normally exposed. Other types of resin require conditions for their formation which would tender or otherwise lower the quality of the fabrics and garments to which they might be applied. But recently a new type of resin which is based on epoxy compounds has been found very useful in the plastics industry and now it has been established that it has a fair opportunity to find use also in the textile industry. The evidence so far obtained by investigation of the properties of such resins in relation to textiles shows that there is reasonable ground to believe that they might sooner or later displace the older urea- and melamine-formaldehyde resin because they have some special advantages which would at present appear to belong to no other type of resin. Since epoxy resins are mainly made from raw materials derived from petroleum it is easy to understand why it is that the initial research on the textile application of epoxy resins has been largely carried out by the Shell Chemical Corporation in America although related research has been carried out simultaneously by other companies.

Advantages

For a new type of resin to be able to take the place of the resins now in common use for giving cotton and viscose rayon materials crease resistance and other desirable properties and whose application has been well worked out so as to give comparatively little trouble it is obviously necessary that it should have one or more outstanding advantages. Actually one such advantage is claimed at present but it is possible that further experience with the new resin will bring to light other advantages. The great merit of an epoxy resin is that it contains no combined nitrogen as do the urea- and melamine-formaldehyde resins and thus does not readily combine with active chlorine such as resin-finished cotton fabrics may encounter whilst being whitened by a hypochlorite bleaching treatment. In other words, a cellulose fibre material finished with an epoxy resin is not chlorine-retentive and for this reason is not liable to become tendered and yellow discoloured during any hot ironing following hypochlorite whitening treatment such as it may meet with during laundering. It is a common complaint, more particularly met with in the U.S.A. than here but important nevertheless, that resin finished fabrics are spoiled by laundering or other processing where the fabric is exposed to a liquor containing active chlorine. By using an epoxy resin instead of the more usually employed nitrogen-containing resins this defect can be entirely eliminated.

There are other faults associated with cellulose fibre fabrics finished with urea- and melamine-formaldehyde resins and they include the possible formation in the finished fabric (during storage) of objectionable odours which are fishy in character and similar to those derived from alkylamines such as the methyl- and ethyl-amines. These odours have been traced to the use of an ammonium salt catalyst in the resin finishing treatment where it is necessary to have present such a catalyst to accelerate resin formation during the curing

stage (heating at a high temperature approximating to 150°C.). Also, in the resin finishing process there is always the risk of escape of formaldehyde vapours and this is harmful and unpleasant to the operatives controlling the process. Another defect of the usual resin finishing process is that it can lower the strength and particularly the tear-strength of the fabric and although this may be in part reduced by the use of cationic and other softeners as an addition to the resin liquor applied it is generally desired that such deterioration should not be inherent in the finishing process. By use of a new type of resin there is always the hope that this will be less harmful to the fabric. This has not been found characteristic of every epoxy resin but since so few resins of this type have been as yet examined there can be the expectation of eventually discovering a number which will have this desired advantage.

A typical epoxy resin such as may be made by reaction of a diphenol (e.g., diphenylolpropane) with epichlorohydrin has the formula shown

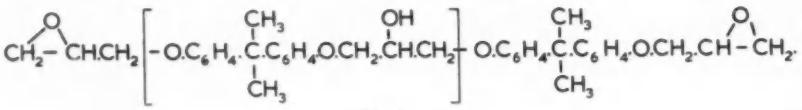

Fig. 1

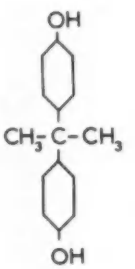

Fig. 2 (left) Diphenylol propane (or para-para-dihydroxy-diphenyl-propane

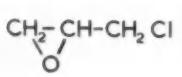

Fig. 3 (above) Epichlorohydrin

in Fig. 1, the reactants being shown at Figs. 2 and 3.

The epoxy resin structure shown above has excellent stability since all the bonds in the chain molecule are carbon-to-carbon or carbon-to-oxygen ether links; its stability is greater than that of urea- and melamine-formaldehyde resin molecules in which there are methylene carbon-to-nitrogen bonds which are more easily hydrolysed, particularly by acids. The presence of a epoxy resin (assuming no cross-linking of it with the adjacent cellulose molecules) could thus be the basis of a finish having superior fastness to laundering treatments. But the

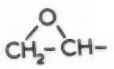

Fig. 4

presence of terminal reactive epoxy (Fig. 4) groups in the resin molecule gives these molecules the power to react with hydroxyl groups attached to near-by cellulose molecules and thus give cross-linking of these cellulose molecules or at least a degree of combination as shown in Fig. 5 which must result in a further stabilisation of the epoxy resin within the cellulose fibres:

Reactions

It is to be noted that the textile finishers in applying epoxy compounds to cellulose fibres will have control over (1) the molecular weight of the epoxy resin attached to each cellulose molecule as shown at (A) and also of the molecular weight of the epoxy resin molecule which cross-links adjacent cellulose molecules as shown at (B). A further point is that in any epoxy compound the reactive group is as shown in Fig. 6 and is termed an epoxy group or *oxirane* ring. It functions by having the power to add on to any other compound which possesses a reactive hydrogen atom present in an amino (NH^2), carboxyl (COOH), or hydroxyl (OH) group. Protein fibres contain amino groups while cellulose fibres contain hydroxyl and may also contain a small proportion of carboxyl groups. The reaction of an epoxy compound with say wool and cotton fibres containing these reactive groups will thus take the courses shown in Fig. 7.

The reactivity of an epoxy group towards amino, carboxyl, and hydroxyl groups is not equal since while the reaction with an amino or carboxyl group is rapid and needs no catalyst the reaction with an hydroxyl group is much slower and requires the presence of a catalyst. Suitable catalysts include strong alkalis, tertiary amines, mineral acids and acid-liberating salts.

In the application of an epoxy resin to a cellulose fibre the most

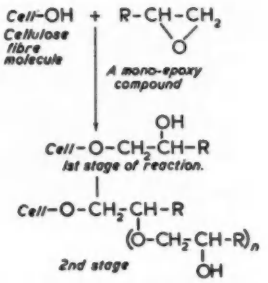

Fig. 5A. 2nd stage of reaction in which only one cellulose molecule is involved and there is thus no cross-linking of cellulose molecules

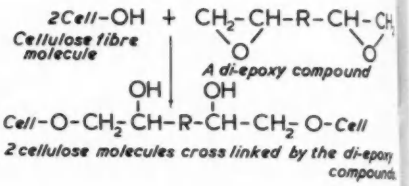

Fig. 5B

important reaction is with the cellulose hyproxyl groups. Referring to reaction (3) above it is seen that if equimolecular quantities of epoxy compound and hydroxyl-containing compound are present then the product tends to be an ether. If there is an excess of hydroxyl-containing compound it is the more likely that such an ether will be of a simple nature. But if there is an excess of epoxy compound then after first formation of the simple ether, this (because it retains a reactive hydroxyl group) will be capable of further reaction with the epoxy compound so that a high molecular weight polymeric product

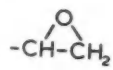

Fig. 6

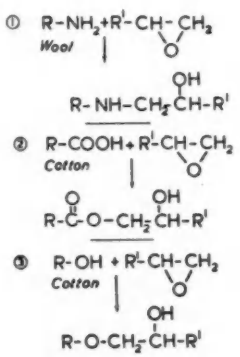

Fig. 7

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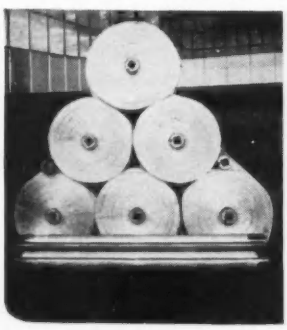

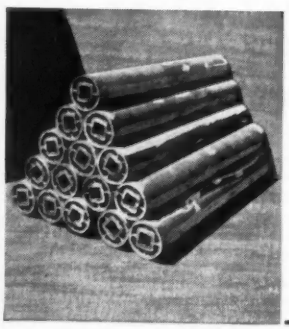

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will be formed rather than a simple ether compound. Thus the nature of the ultimate product of reaction between a cellulose fibre or other hydroxyl-containing compound and an epoxy compound may be varied by suitably choosing the proportion of epoxy compound applied.

Improved Properties

From all that has been stated above it would appear that there is a good possibility of using epoxy compounds for producing in cotton and regenerated cellulose fibre fabrics enhanced crease and shrink resistance and all the other finishes associated with the use of synthetic resins and so it will be interesting to see the way in which these epoxy compounds have actually been applied in finishing textile goods and as described in U.S.P. 2,752, 269. A significant claim made in the patent specification is that by applying to a fabric a solution containing a relatively small proportion of a polyepoxide and subsequently curing the polyepoxide within the fibres of the fabric in the presence of a suitable catalyst there can be produced excellent resistance to creasing and rubbing yet allowing a soft handle, improved resistance to shrinkage during washing, and good resiliency while the fabric is left in a state so that it shows no tendency to retain chlorine so that the finished fabric may be bleached with chlorine without danger of being discoloured or charred or weakened during subsequent heat treatments. All these improved characteristics are stated to be fast to repeated washing.

The above treatment with a polyepoxide must be effected with compounds which contain at least two reactive epoxy groups per molecule and this indicated that the cellulose molecules within the fibres are expected to become cross-linked. Another point is that the epoxy compound used is first self polymerised to an appropriate degree (but is left water-soluble) and in fact it should have a molecular weight of about 400 to 600 but this may reach 1000 in certain circumstances.

A very large number of epoxy compounds may be used for such textile finishing and many have been examined with a view to selecting the most effective and suitable as regards conditions of application. Most of this research has been described by C. W. Schroeder and F. E. Condo (J. Text. Research, 1957, **27,** 135) and some very interesting facts have been recorded. The most satisfactory epoxy compound discovered is now being marketed by the Shell Chemical Corporation under the trade name of Eponite 100.

Before discussing in more detail the various factors which enter into the application of an epoxy compound to say cotton and viscose rayon fabrics it will be convenient here to describe a particular example in which there is used a glycidyl polyether of glycerol as the epoxy compound and which contains two reactive epoxy groups and has a molecular weight of about 324.

Firstly the glycidyl poly-ether is prepared by adding 10 parts of a 4½% solution of boron trifluoride (a catalyst) in diethyl ether to a mixture of 276 parts (3 moles) of glycerol and 832 parts (9 moles) of epichlorohydrin, and then maintaining the temperature of this mixture at 50 to 75°C. for three hours to effect condensation between the glycerol and epichlorohydrin.

At this stage there has been formed a simple di-epoxy derivative of glycerol

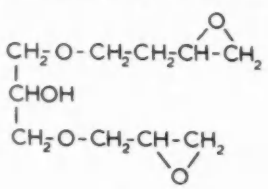


Fig. 8

approximating to Fig. 8, but having a molecular weight of only about 177. Since it is desirable for a more complex glycidyl polyether to be formed for application to the cotton or other fabric about 370 parts of this product are dissolved in 900 parts of dioxane containing about 300 parts of sodium aluminate (a catalyst) and the resulting solution is heated at 93°C. (under reflex condenser) for nine hours. The product is then cooled.

The resulting polyether is then obtained as a pale yellow viscous liquid by filtering the reaction mixture to remove insoluble substances and then distilling off unchanged reactants under reduced pressure. A yield of about 260 parts of the glycidyl polyether of glycerol is thus obtained.

Treating Cotton

The fabric impregnating liquor is then prepared by dissolving in a liquor made up of 140 parts of iso-propyl alcohol and 420 parts of water some 100 parts of the glycidyl polyether of glycerol (prepared as above) and adding 20 parts of citric acid (a catalyst). Cotton fabric is then impregnated with this liquor so as to secure a 65% liquor pick-up and it is then dried at about 60°C. for 15 mins. and further cured at 160°C. for 5 mins. The finished fabric is then washed at 70°C. for 10 mins. in a liquor containing soap and sodium carbonate and is finally rinsed and dried.

The finished cotton fabric thus obtained has excellent crease resistance, good tensile and tear strengths, no chlorine retention, and is resistant to changes in these properties such as might be produced by washing treatments. A comparison made using similar cotton fabric made crease-resistant by a normal urea-formaldehyde process gave the data set out in Table I.

These data show that by use of the epoxy resin specified above cotton fabric can be given a substantially increased resistance to creasing with considerably less strength deterioration than when the same crease resistance (or less) is obtained with a urea-formaldehyde resin. Further, it appears that it requires less of the epoxy resin than the urea-formaldehyde resin to obtain any given degree of crease resistance. These advantages are, it is important to recognise, obtained together with a finished fabric which does not have the defect of chlorine retention. This latter point can be made more clear by reference to some tests on the fabric finished with the glycidyl polyether of glycerol as described above.

The finished fabrics (finished with the epoxy resin and with the urea-formaldehyde resin) were dipped for ten minutes in a hypochlorite liquor containing 0·4% of active chlorine

TABLE 1

Resin applied	% Resin fabric	% Increase in Crease resistance (warp)	% Decrease in tear strength (warp)
Glycidyl polyether of glycerol	5·21	52·8	22·4
Ditto	1·75	44·3	4·7
Urea-formaldehyde resin	6·20	42·7	33·1
Ditto	3·16	25·4	17·8

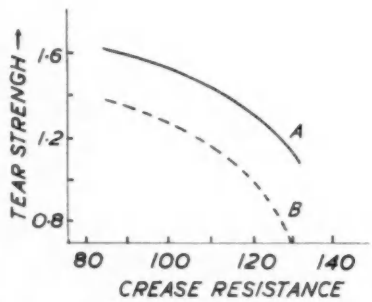
TABLE 2

Resin in fabric	Ironed fabric Tear strength	Ironed fabric White Colour	Non-ironed fabric Tear Strength	Non-ironed fabric White Colour
Glycidyl polyether of glycerol	0·98	68·4	1·36	82·6
Urea-formaldehyde resin	0·06	6·8	1·14	83·2
Melamine-formaldehyde resin	0·07	26·1	1·20	81·3
A commercial fabric made crease resistant by treatment with an aminoplast resin	0·05	8·2	2·64	77·5
Untreated fabric	1·29	69·5	2·32	82·5

with the temperature maintained at 140°F. and with a liquor/fabric ratio of 30/1. The fabrics were then washed thoroughly, dried, and placed under a hot iron for 30 secs. They were then compared in respect of discoloration and tear strength so that the data set out in Table 2 was obtained.

The effect of the hot-ironing of the bleached fabrics is important in so far as the high temperature treatment reveals deterioration which would not be suspected from casual examination of the non-ironed fabric; particularly important is the loss of tear strength produced by the hot-ironing of the fabrics finished with aminoplasts (urea- and melamine-formaldehyde resins). The non-chlorine retention of fabrics finished with epoxy resins is also valuable since it allows such finishing to be applied to white goods or those required to be left with bright pastel shades.

The reduction of tear strength which takes place in cellulose fibre fabrics finished with resins arises from an embrittlement of the fibres and threads —these become more rigid and thus tend to break rather than stretch and bend to accommodate the tearing and distorting forces. To some extent this defect can be avoided by including in the resin impregnating liquor a suitable proportion of a softening agent. The type of softener recommended by Schroeder and Condo for use with an epoxy resin is an epoxidised unsaturated vegetable oil such as epoxidised soya bean oil. Some 20 parts of this softener per 100 parts of epoxy resin is effective. Care should be taken not to make use of a softener which contains nitrogen since nitrogenous substances so introduced may give the finished fabric a tendency to retain chlorine. The reason for recommending epoxidised oils as softeners is that while they are free from nitrogen they also tend to become combined with the epoxy resin employed and so give a softening more fast to washing.



Graph No. 1. Curves showing how the tear strength of a cotton fabric finished with 5% Epoxite 100 is preserved by the addition of 20 parts of an epoxidised soya bean oil softener per 100 parts of Epoxite 100 (Curve A with softener, and Curve B without)

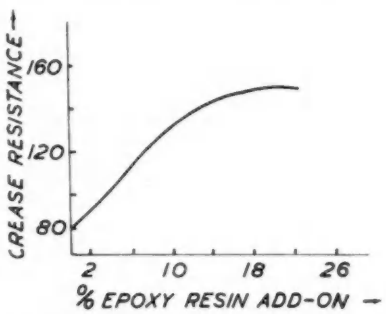
The beneficial effect of a softener (epoxidised soya bean oil) in finishing with an epoxy resin (20 parts per 100 of epoxy resin) on the tear strength of the fabric can be judged by the curves in graph No. 1. This benefit is obtained even when high resin proportions are employed to secure the maximum crease-resist values. It is also found that instead of ordinary softeners there can be used synthetic rubber latices of the type of Hycar 1561. When 30 parts of this are used per 100 parts of epoxy resin a tear strength loss of 27% is obtained whereas without such addition of softener the loss is 38%.

It has been previously mentioned that epoxy resins are resistant to hydrolysis by both acids and alkalis and from this it might be expected that fabrics finished with such resins would not be adversely affected by several launderings. The data in Table 3 obtained in washing epoxy resin finished cotton fabric in a home washing machine illustrate this point:

The durability of an epoxy resin finish towards acid treatment was established by agitating some of the resin-finished fabric for 25 mins. in fifty times its own weight of a 0·1 N. hydrochloric acid solution at 150°F. and following this with a thorough wash and drying. The crease resistance of the fabric was unchanged by this treatment. In comparison, a fabric made similarly crease-resistant by treatment with an ethylene urea-formaldehyde resin lost practically all of its resistance to creasing when treated with the acid liquor under the same conditions.

Viscose Rayon

In the crease resist finishing of viscose rayon with urea- and melamine-formaldehyde resins it is generally necessary to apply about 15% of the resin to secure a satisfactory result; with cotton fabrics about 50% more resin must be employed. The curve in graph No. 2 shows in a comparable manner how a somewhat smaller proportion of an epoxy resin can be used for cotton fabric. Graph No. 3 shows how this resin affects the tensile strength. From these curves it is seen that most of the loss of tensile strength is caused by the first add-on of resin and less by the further amounts. In contrast, it is the first add-on of resin which produces the most increase of crease resistance—further resin add-on contributes less to the crease-resistance. Thus with the first resin add-on of 7% the crease resistance is increased from 81 to 118 whereas with an add-on of 10·5% the crease-resistance is raised to 134. Thereafter the increase is only to 149 with a total resin add-on of 21%.



Graph No. 2. Curve showing how the crease resistance of a cotton fabric increases with the amount of epoxy resin used

TABLE 3

% Resin present in fabric	Crease resistance 1 wash	10 washes	20 washes
10·5	132–134	132	127
7·0	116–120	122	115

The commercial epoxy resin product Eponite 100 now available for use in textile finishing works has a composition not disclosed but it is chosen from many resins of this type. U.S.P. 2,752,269 lists a large number of epoxy resins which can be used and it mentions that those resins which contain an ethylenical unsaturated group such as is shown below in Fig. 9 can be very effective.

$$\underset{poly}{(CH_2{=}C{=})} \qquad \text{Fig. 9}$$

An example of such an epoxy compound is a poly (allyl glycidyl ether) and this can be prepared by heating a mixture of 100 parts of allyl glycidyl ether, an equal amount of benzene, and 3% of di-tertiary butyl peroxide, at 155°C. until the molecular weight of the resulting poly (allyl glycidyl ether) has attained 480 to 540. The benzene is distilled off from the product to leave the required poly (allyl glycidyl ether).

In using this particular epoxy compound a fabric impregnating liquor is made up of 100 parts of the poly (allyl glycidyl ether), 140 parts of iso-propyl alcohol, and 420 parts of water with the further addition of 40 parts of citric acid. Cotton fabric is then padded with this liquor to secure a 65% liquor pick-up, then dried at 60°C. and thereafter cured at 160°C. for 5 mins. After washing and drying the resulting fabric is found to have a 61% increase of resistance to creasing and this finish is especially fast to washing as shown by the data in Table 4.

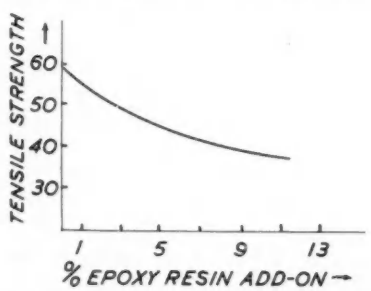
TABLE 4

Resin in fabric	Loss of weight in a wash at 70°C. in a liquor containing soap and sodium carbonate
Poly (allyl glycidyl ether)	1·6%
Urea-formaldehyde resin ..	20
Melamine-formaldehyde resin ..	20

The Catalyst

The necessity to use a catalyst in the epoxy resin impregnating liquor arouses an enquiry as to which is the best catalyst to use. This point has not yet been finally settled and a large number of various potential catalysts have been investigated. It has been established that epoxy groups are less reactive than the methylol groups which play a part in the formation of urea- and melamine-formaldehyde resins so that amine hydrochloride, metal halides, and ammonium phosphates are not as effective with epoxy resins as with aminoplasts. Much stronger catalysts are required for the epoxy resins. Zinc fluoborate has been found very efficient when used with Eponite 100 and it appears satisfactory to use 7¼ parts of this catalyst per 100 parts of Eponite 100. However, this aspect of the application of epoxy resins to textiles is receiving further attention. The use of organic acids including citric, tartaric, aconitic, maleic, oxalic, boric, and phosphoric acids is indicated in U.S.P. 2,752,269 and while boric acid is least effective, citric acid seems to be most effective followed closely by tartaric acid.

The epoxy resins now appear likely to compete with urea- and melamine-formaldehyde resins in the resin finishing of textile materials and it will be most interesting to follow the effects of this in the near future especially as the time has come when many textile finishers are seeking methods and means for avoiding some of the defects met with in applying the resins now in use.



Graph No. 3. Curve showing how the tensile strength of cotton fabric is lowered with the amount of epoxy resin used

New Book

INDUSTRY AND TECHNICAL PROGRESS. By C. F. Carter and B. R. Williams. Oxford University Press, Amen House, Warwick Square, London, E.C.4 (price 25s.).

This report has been prepared by two economists, Professor Carter, of Queen's University, Belfast, and Professor Williams, of University College of North Staffordshire, in their capacity as Directors of Research to the Science and Industry Committee, sponsored by the British Association, Royal Society of Arts and the Nuffield Foundation. Funds, amounting to £20,000, were provided under the "conditional aid" scheme, augmented by D.S.I.R. grant. The committee was instructed to "study the problems of speeding up in industry the application of the results of scientific research." Physicists, chemists, engineers, accountants and business men have all helped in the necessary investigations. One exceedingly good feature of this book is the way in which the authors dispose of some popular generalizations on hindrances to technical progress in British industry. Their studies have not been undertaken with any ready acceptance of pre-conceived ideas or common conclusions.

Starting with the economic background, the writers pursue a logical course in examining first, the many problems of basic research in Britain and point out that the limited output of scientists and the somewhat belated recognition of the need for research have led to rather inadequate and uneven applied research in industry. Two chapters deal with industrial research as a management technique and the ways in which the outflow from research and development comes into use. Examples taken from the textile industry include the Raper "Autoleveller" and the formation of Shirley Developments Ltd. A brief study of the difficulties of the results of research and of their interpretation by scientists and laymen is followed by examination and discussion of such key factors in the application of science and technology as finance, supply of trained personnel, effects of taxation, the varying degrees of receptivity displayed by firms and the creation of a favourable environment.

A separate chapter brings together the various elements making up the technically progressive firm and lists those characteristics which distinguish it from backward undertakings. Case studies of three types—general, industry, and specific innovation—are summarised. Although the problem of the application of scientific ideas to industry has exercised the minds of many scientists, documentalists, economics and industrialists, the work under review gives more frank and full analysis than has previously been available and, if the authors appear at times rather hesitant in suggesting solutions, it may be that more specific answers will be forthcoming in the three projected reports mentioned by Professor Carter at the 1957 meeting of the British Association. The volume is very well-produced, but the indexing is not worthy of the text, e.g. The British Cotton Industry Research Association is referred to throughout as "Shirley Institute" and indexed accordingly.

S.P.S.

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SOUTH AMERICAN HANDBOOK, 1957-58. Trade and Travel Publications Ltd., 14 Leadenhall Street, London, E.C.3 (price 10s. 6d.).

Constant, scrupulous revision and steady enlargement of scope have ensured the accuracy and comprehensiveness of successive editions of this guide to South and Central America, Mexico and Cuba. In over 900 pages, this thirty-fourth edition tells the prospective traveller how to get there, where to stay and how to travel quickly and live well, besides furnishing background information on each country's history, economy and social life essential to a pleasant and satisfactory visit. There are numerous town-plans and an 8-page sectional coloured map. Anyone interested in Latin America will find this moderately-priced guide of the highest value.

C.L.W.

Mill Procedures for Dyeing and Finishing "Orlon"*

Information on the dyeing of "Orlon" rawstock, methods for tow and top, skein dyeing of high-bulk yarns, piece dyeing, and finishing of yarn and tow dyed sweaters, men's hose and fine gauge jersey

By Dr. F. G. PARKER†

FOR knitted outerwear the knitter can purchase "Orlon" yarns that were made from dyed rawstock or tow or top. He can have natural yarns dyed either in packages or skeins but the most widely used method is piece dyeing knitted fabric either as complete sweater bodies or in strips of sweater blanks. We estimate the breakdown according to dyeing methods in the U.S. as follows:—

"Orlon" Dyed for Knitted Outerwear

	(lbs.)
Stock	10,000,000
Tow and top	5,000,000
Yarn in packages	15,000,000
Yarn in skeins	10,000,000
Piece goods	90,000,000
Total	130,000,000

These figures represent the total poundages of "Orlon" acrylic fibre dyed in each form for knitted outerwear since the introduction of Type 42 staple in 1953.

Rawstock Dyeing

Disperse and cationic dyes are most often used to dye rawstock of "Orlon." Formerly, considerable poundages were dyed with acid dyes using the cuprous ion method. However, the simple procedures for application of the new cationic dyes as well as their good fastness properties have resulted in the virtual disappearance of the cuprous ion procedure for dyeing "Orlon." A complete shade range can be dyed at 205°F. with the disperse and cationic dyes. Higher temperatures are not necessary, but time can be saved in the deeper shades by dyeing under pressure at 225°F. The following procedure is used:—

(1) Half fill the kier with water and heat the water to a temperature of 200 to 210°F.

(2) Load the rawstock evenly into the kier.

(3) Open the drain and remove part of the water until the water level is three to six inches below the level of the rawstock. This forms a hard compact cake which fits tightly against the walls of the kier.

(4) Close the kier, fill it with water, and set the bath temperature at 180°F.

(5) Add the dissolved chemicals and dyes, and circulate the bath for 10 mins.

(6) Raise the bath temperature to 208 to 210°F. at a rate of about 1½°F. per min. and hold this temperature for one to two hours depending upon the depth of shade. Dyeings made at 230°F. with cationic dyes require one-half to one hour at temperature.

(7) Cool and drop the dyebath; then rinse and scour the rawstock.

(8) Apply a finish to the fibre to provide spinning lubricity and static protection. A combination of 1% "Avitex" NA softener and 1% "Nopco" LV-40 antistatic agent is recommended.

Best results have been obtained by spraying on the finish during blending prior to picking. Some mills have found that drying of rawstock of "Orlon" is unnecessary after dyeing. The stock is centrifuged until it contains about 10% moisture. The finish is added, allowed to condition for at least 48 hours, and is then ready for processing.

Tow Dyeing

Dyeing tow is important because it permits the production of dyed yarns containing high-shrinkage fibre. The dyeing process removes shrinkage from the fibre, and it is not practicable in the case of rawstock or top to stretch the fibres again after dyeing. Tow can be dyed and then stretched and broken on the Turbo Stapler to produce high-bulk dyed top.

Basket Method

"Orlon" tow dyed commercially has been handled by two methods. The first consists of plaiting the tow into a stainless steel basket and then dyeing it in a package dyeing machine having a centre spindle. Handling is facilitated by wetting out the tow before it is plaited into the basket. After dyeing finish is applied. The tow is extracted and then dried. Belt dryers have been employed, can dryers have been used, and skein dryers are also used. After drying, the tow is repackaged either by plaiting into the original carton or by winding into balls for the spinner.

Spindle Method

The second method for dyeing tow consists of winding it into balls and dyeing on spools. It is desirable to split the tow into its individual segments or ribbons before dyeing. Our 3 den. per filament tow of 470,000 total den. can be separated into four equal ribbons each of approximately 117,000 total den. and 1,800 yds. length. These individual ribbons can then be wound into one 60 lbs. or two 30 lbs. balls. By splitting the tow rather than cutting it into shorter lengths, waste is minimised in subsequent processing. A firm, tight ball should be wound for dyeing, since the tow crimp tends to come out during dyeing, causing the tow to elongate and the package to soften. After dyeing, the bath should be cooled down slowly and not dropped until cool. Finish can best be applied by padding the tow. Drying can be carried out in belt or pole dryers. Port dryers can be used if fitted so that 60 lbs./sq. in. gauge steam pressure can be blown through the balls in the early stages of drying. Using hot air alone requires excessive time for drying. Tow dyed and processed in this manner can be shipped in ball form provided the spinner has a creel to handle the spools so that the individual ribbons may be combined and fed into the Turbo Stapler.

Top Dyeing

The key to successful top dyeing of "Orlon" acrylic fibre is reduction of liquor pressure. A gentle flow is necessary to avoid distortion of the top, channelling, unlevel dyeing, and excessive crimp removal. Level dyeings have been made with both the Fredericks and Abbott systems. Liquor pressure can be reduced on the Fredericks system by installing a gate valve between the discharge side of the pump and the spindle. With an 18 ins. head of liquor in the kettle and the pump running but no stock present, this valve can be adjusted so that no liquor flows out of the top third of the spindle. Other means of reducing the liquor pressure can be used, such as changing the size of the pulley or installing a slower speed motor.

In the Abbott system liquor pressure has been reduced by raising the cap of the spool ¾ in., thus permitting the liquor to escape through the top of the spool as well as through the stock itself. This results in a more gentle flow through the top. After dyeing, a lubricant and antistatic finish must be applied to facilitate subsequent processing. The finish can be applied in the final rinse, or in backwashing.

Yarn and Package Dyeing

Staple yarns can be dyed in package or skein form. The same principles of dye selection and dye-bath composition applying to rawstock and top also apply to spun yarns. Disperse or cationic dyes are used. Disperse dyes are preferred for pastel shades, while cationic

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* *From a paper to a recent trade conference in Leicester.*

† *Technical Service Section, Textile Fibres Dept., E. I. du Pont de Nemours and Co., Inc.*

The Conquest of Friction

Amongst the finds when Lake Nemi in Italy was being drained in 1928 were curious relics from the time of the Emperor Caligula.

One of these is the earliest authentic example of a ball thrust bearing, the device consisting of two wooden discs and eight bronze balls with trunnions. It is conjectured that the upper disc carried a central statue with smaller statues grouped round it, the whole revolving on a central peg and turning to bring all aspects of the statue successively into view.

The present-day equivalent of the Roman statue is found in the City of Bombay where a heavy revolving statue is mounted on an SKF thrust bearing.

It is one application of many where SKF bearings are used. Other thrust-type bearings from the unique range of bearing types manufactured by SKF include single and double thrust ball bearings, taper roller bearings and spherical roller thrust bearings.

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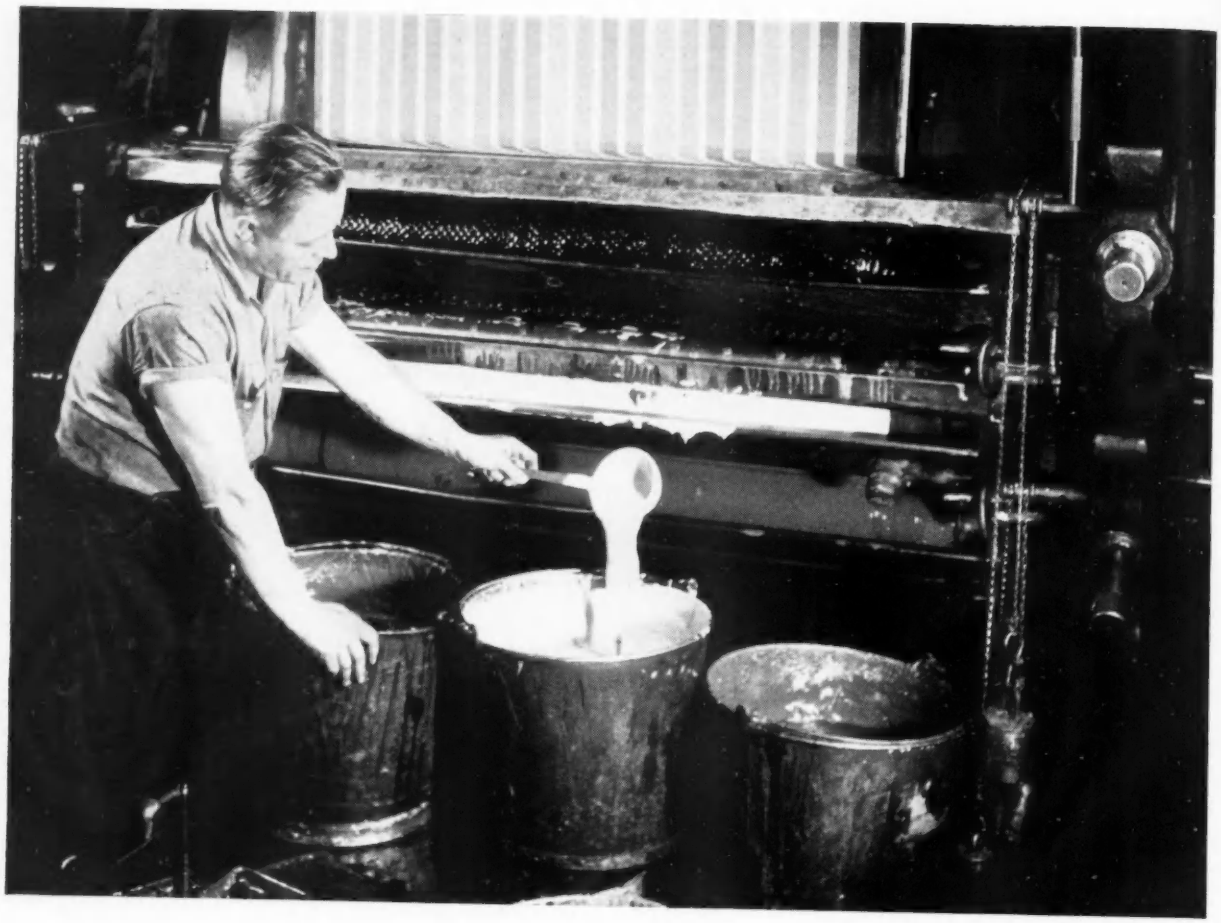

How to set the pace in fastness

A significant advance in textile printing occurred with the advent of resin-bonded pigments. These new colours permitted striking patterns in brilliant shades with excellent fastness to sunlight, atmospheric fumes, washing and dry cleaning. But they still left something to be desired on crocking.

What was needed was a simple method of better protecting the pigments against severe abrasion. Today's solution is one in which CHEMIGUM LATEX plays a major role. Easily modified with other materials and mixed into the colours at the printer's, CHEMIGUM LATEX helps form a protective coating which locks in the pigment particles. The end result sets the current pace in fastness to crocking, plus even further improving resistance to washing.

Putting a liquid lock on pigment colours is one of many textile uses for CHEMIGUM LATEX. Its high binding strength, flexibility, light colour–and resistance to washing, dry cleaning and age–are finding wide application in binders, coatings, finishes and adhesives of all types. To learn more about CHEMIGUM LATEX–contact your nearest Goodyear Chemical Distributor.

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dyes are used for all others. Package dyeing is preferred for the regular shrinkage yarns (not high bulk) for reasons of economy. These yarns are dyed on Franklin or Davidson springs using either a 1⅛ ins. or ⅜ in. tube; the 1⅛ ins. tube is preferred. Since the yarn tends to relax and elongate in the hot dyebath, flow rates and package hardness are important. Pump pressure should be no more than 25 to 30 lbs./sq. in. gauge pressure. A fairly hard package should be wound. Packages too soft tend to slough at the shoulders during dyeing. Once flow rate and package hardness are correctly adjusted, package dyeing of "Orlon" should be trouble-free. After dyeing, the yarn is cooled slowly to preserve maximum softness. "Avitex" NA softener is applied as an anti-static finish in the final rinse.

Skein Dyeing

High-bulk yarns should be skein dyed since their shrinkage, which ranges from 16 to 25%, makes package dyeing impractical. Successful skein dyeing of high-bulk fibre requires submersion-type equipment. These machines should be equipped with an adjustable double bar rack or carriage and designed to have adjustable two-way flow. "Orlon" has low resistance to stretch under hot, wet conditions. If the yarn is stretched in a hot dyebath, it cannot be relaxed to regain the bulk. Several safeguards must be taken to obtain and preserve maximum loft and bulk during dyeing:—

(1) The pole spacing is set to allow yarns to relax freely so that after relaxation the skeins should hang two inches below the lower pole.

(2) The machine loading is near 60% of zephyr wool yarn capacity to accommodate the greater bulk of "Orlon."

(3) Uniform flow as well as short, equal, bi-directional flow cycles are needed to dye the portions of the skeins resting on the bars.

(4) To preserve the bulk, yarns should never be removed from a bath exceeding 120°F.

The normal sequence of operations for skein dyeing is shown below:—

Relaxation—Lower the loaded carriage into a still bath set at 200 to 205°F. and containing 1% of a non-ionic detergent. Allow the yarns to shrink for 3 to 5 mins.

Scouring—Start the circulation and continue it for about 15 mins. Cool the bath to 120°F. and drop it.

Dyeing—Set a fresh bath at 120°F. with the necessary chemicals and dyes and raise the bath temperature to the boil at a rate of about 2°F. per min. Boil until the proper shade is reached. For shade sampling, use small skeins attached to a string that can be removed singly without raising the carriage. Cool the bath to 120°F. and drop it. Scouring is necessary only for medium and dark shades or where exhaustion is not complete.

Finishing—Apply a softening agent from a fresh bath set at 120°F. and containing 0·5% acetic acid (56%). Use 0·5 to 1% of softening agent for machine knitting yarns and 1 to 2% for hand knitting yarns. More than 1 to 2% finish over-lubricates the yarn and reduces yarn strength because of fibre slippage.

Drying—After applying the finish, centrifuge the yarns. Drying is not usually necessary. If drying is required, it can be done at 140°F.

Coning—In winding skein-dyed yarns from swifts on to cones, keep the yarn tensions as low as possible.

Piece Dyeing

By far the greatest poundage of knitwear of "Orlon" is dyed in piece form. Some 30 or 40 dyers in the U.S. have participated in this business, and the procedures they have used are remarkably uniform. Either fully fashioned garments or sweater blanks in strips, knit on transfer machines, are handled. Paddle dyeing machines are used exclusively and the goods are dyed in filament, preferably polyester filament, bags.

The garments or strips should be folded and loaded so that they can move freely within the bag during dyeing. Underloading or overloading should be avoided to prevent distortion, wrinkles and tangles. Optimum loads for 52- by 36-ins. bags (⅛ in. mesh) made from polyester fibre is about 15 lbs. of transfer bodies or 5 lbs. of fully-fashioned garments.

After dyeing the bath is cooled down slowly. The importance of slow cooling after dyeing cannot be emphasised too strongly. For best results let the bath cool in air, with the paddle running to about 170°F., then feed in cold water slowly until the bath is at room temperature, where it can be drained. Following dyeing, the goods are scoured and then a softener is usually applied from a fresh bath. In the next step the fabric, still in bags, is extracted in a centrifuge. The material is then removed from the bags and tumble dried at about 180°F. in rotary dryers.

Removal of Wrinkles

An occasional lot of sweaters may become wrinkled because of mechanical failure or human error but it is usually possible to correct this. Careful steaming removes many wrinkles and more persistent wrinkles can often be removed by wetting out the goods and tumble drying at a higher temperature, about 200 to 220°F. If neither of these procedures removes stubborn creases, the entire finishing procedure should be repeated, beginning with mock dyeing or boiling of the bagged material in the paddle machine.

Finishing Yarn-Dyed Sweaters

Sweaters made from dyed yarn are finished by methods similar to those used for piece-dyed material. Sweaters made from stock-dyed, top-dyed, package-dyed or skein-dyed yarns are knit directly to size, and the garments show little or no shrinkage in finishing. The usual finishing sequence consists of a low temperature scour, followed by application of a softener and then tumble drying. The hand of sweaters made from two-ply yarns can be further improved by additional treatment in the tumble dryer at 230°F. This treatment is carried out on the dry fabric for 10 to 30 mins. Light blue shades and white should be treated for the minimum time to avoid yellowing. The hot, dry tumbling softens the fabric and clarifies the stitch. It is necessary, of course, to cool the fabric slowly after the treatment and continue the tumbling action during cooling. This procedure is not recommended for interlock stitch fabric of singles yarns, since distortion is apt to occur.

Finishing Tow-Dyed Sweaters

Fabric made of high-bulk, tow-dyed "Orlon" fibre is finished differently from other yarn-dyed fabrics. The tow-dyed material must be relaxed during finishing without bleeding the dyes. This is accomplished by steaming the fabric in a relaxed condition. The bodies can be steamed individually on a steam table or strips of bodies can be plaited in open width loosely on an endless mesh belt and carried over steam banks. Bulking and shrinkage are complete after as little as 10 sec. steaming. Following steaming, the goods should be washed at no higher than 160°F., finished with a softener and then tumble dried.

Men's Hose

Hose of "Orlon" are dyed and finished in much the same manner as sweaters; preboarding is not used. The socks are dyed in rotary hosiery machines or paddle machines and after dyeing a finish is applied. Following extraction, the damp hose are postboarded at a relatively low temperature—no higher than 220°F. "Zelec" DX durable anti-static agent which can be applied by exhaustion from the final rinse using "Avitex" FB anti-static developer, is particularly recommended for hose of "Orlon." This finish imparts protection against static electricity through many washings and prevents the pickup of lint by static attraction during wear.

Fine-Gauge Jersey

"Orlon" has made a rapid penetration of this field during the last three years. "Orlon" imparts dimensional stability, shape retention and the ability to accept durable pleats to a fabric that has long been noted for its beauty and drape. To a mill man, the preferred blend of 80% "Orlon" with 20% wool has the advantage of versatile dyeability. Solid shades, cross dyes, and light or dark heathers can all be dyed on the same style of grey goods. Dyeing and finishing of fine-gauge jersey is carried out on conventional equipment.

Dyeing

Jersey of "Orlon" and wool is dyed with cationic and acid dyes, and jersey of "Orlon" is dyed with disperse or cationic dyes. Following dyeing, the bath should be cooled slowly at about 1°F. per min. from the boil to 170°F. without adding cold water to the bath. From 170 to 100°F. cooling can be at the rate of 2 to 3°F. per min. Slow cooling is necessary to minimise stitch deformation and formation of rope creases.

Finishing

The following procedure is suggested as a starting point for establishing a finishing routine:—

(1) For a very soft hand apply 1 to 2% of a cationic softener together with 1% of acetic acid in the final rinse at 120°F. A crisper hand results when no finish is used. Additional body can be obtained by padding the fabric with 10 grams per litre of "Methacrol" NH resin dispersion and 1·7 grams per litre of "Avitex" NA softener.

(2) Cool the fabric and extract the excess finish by centrifuging. Hot or warm fabric should never be centrifuged, since creasing would result.

(3) (optional) Rope marks or cracks can be removed by steaming the fabric on a tensionless calender operated at slow speed with full steam flow.

(4) Dry the fabric at 200 to 250°F. Any of the commercial types of dryers in use for jersey are suitable.

(5) Treat the fabric on a tensionless calender. Roll pressures should be reduced or eliminated to avoid glazing.

Technical Facts About "Courtelle"

"Courtelle" is a low-density, creamy-white fibre available in staple lengths up to 2½ ins. for the cotton system; 2½, 4 and 6 ins. for the worsted system and in a variety of deniers for use on the woollen system

"COURTELLE" is a new acrylic fibre, the result of intensive research and development in Courtaulds' own laboratories. It is a man-made fibre of mineral origin, formed by a combination of polyacrylonitrile and minor proportions of other constituents. A plant at Coventry is now producing it in commercial quantities and a new plant at Grimsby, specially designed for "Courtelle" production, will be in operation early in 1959.

"Courtelle" is a low-density, creamy-white fibre which combines the bulkiness, resilience and warmth of wool with good tensile properties in both the wet and dry state, good light stability, and the inherent virtues of man-made fibres which can be tailored to suit all spinning systems.

"Courtelle" is produced in two qualities, "standard" and "high shrinkage." The "standard" material has been dimensionally stabilised to boiling water, in which it shrinks only about 1%, whereas the "high shrinkage" fibre has been purposely left in a condition which results in 15–17% contraction. By judicious blending of the two types the well-known high bulk effect may be obtained. This enhances to a remarkable degree the natural bulkiness of "Courtelle" and is of particular value in knitwear, to which it imparts outstandingly soft and light-weight characteristics.

"Courtelle" is produced in a range of deniers and staples suitable for all spinning systems, and with a degree of crimp appropriate to the staple length. For processing on the flax system the longer staples can also be supplied with no crimp. In Table 1, the types (X) are available:—

Table 1

Denier	1 7/16″	2″	2½″	4″	6″
15 ..	—	—	X	X	X
9 ..	—	—	X	X	X
6 ..	—	—	X	X	X
4·5 ..	X	X	X	X	X
3 ..	X	X	X	X	—
2 ..	X	X	—	—	—
1·25 ..	X	—	—	—	—

Additional types can be made available if required in sufficient quantities. "Courtelle" can also be supplied in continuous tow for processing on the various systems of tow-to-top conversion and it is available in semi-dull and "bright" types.

Spinning

"Courtelle" can be used alone, or in blends with other natural and man-made fibres. Blending can be effected by conventional methods on standard systems.

Owing to the exceptional bulkiness of "Courtelle," laps and slivers can be expected to be loftier than those of other fibres, and therefore allowance should be made during processing.

Due to the openness of the "Courtelle" fibre as supplied to the mill, it will be found that the amount of preparation can be reduced to a minimum. The absence of impurities permits cleaning points to be by-passed, which reduces the amount of waste.

"Courtelle" has adequate cohesion for processing, and all types of revolving flat and roller and clearer cards can be used. An anti-static finish is applied to "Courtelle" and no static trouble should be experienced even at relatively low humidities.

Cotton System

Staple lengths up to 2½ ins. are supplied for use on the cotton system. Conventional practice obtains during the drawing operations, although slightly wider roller settings may be required to allow for its bulky nature.

To enable smooth drafting to take place on speed frames, it is recommended that lower twist factors are employed for "Courtelle" than are required for "Fibro." The characteristic bulkiness of slubbings and rovings, combined with the low twist employed, may necessitate slight changes to the lifter and builder mechanisms, but providing the necessary adjustments are made, no difficulties should be met in building good, firm packages. Yarns may be spun without modification to existing spinning systems and by appropriate selection of twist and count very full yarns can be produced.

Worsted System

It is recommended that 3-den. "Courtelle" should be used on the worsted system for blending with wool. This is available in 4 ins. and 2½ ins. staple and can thus be used on any type of worsted drawing system; 4½-den. 6 ins. material is also available. Processing on this system presents no problems, and combing noil and spinning board waste figures will be of a low order. Combing on the Noble comb can be carried out with high tears, and the tops will have a good mean fibre length coupled with a low nep content and adequate cohesion.

* *Reproduced by courtesy of Courtaulds Ltd. from a recent publication.*

Properties

	Tenacity in Grams/Den. Dry	Tenacity in Grams/Den. Wet	Extensibility % Dry	Extensibility % Wet	Density	% Moisture Regain at 65% R.H., 68°F.	Water Imbibition %	Effect of Heat	Alkalis	Acids	Insects and Micro-Organisms
"Courtelle" Staple	3·3 - 3·6	2·4 - 2·9	40 - 45%	40 - 45%	1·15	1·3	8%	Does not melt. Sticks at 560°F.	Moderately resistant	Resistant	Not attacked by mildew or moths
Wool	1·0 - 1·7	0·8 - 1·6	25 - 35%	25 - 50%	1·32	16	40%	Scorches at 400°F. Chars at 572°F.	Attacked	Destroyed by hot sulphuric acid. Resistant to others	Attacked by moths. Some resistance to mildew
Cotton	3·0 - 4·9	3·3 - 6·4	5 -10%	5 - 10%	1·54	7	60%	Does not melt. Thermal Degradation above 330°F.	Swells	Strength deterioration followed by disintegration	Not attacked by moths. Attacked by mildew
Viscose Staple	Standard 2·2 - 2·6	1·0 - 1·4	18 - 30%	20 - 40%	1·53	11 - 13	90%	Does not melt. Thermal Degradation above 330°F.	Swells	Strength deterioration followed by disintegration	Not attacked by moths. Attacked by mildew
	Strong 3·3 - 3·7	2·2 - 2·6	19 - 22%	22 - 26%							
Acetate Staple	1·1 - 1·3	0·7 - 0·8	30 - 35%	40 - 45%	1·32	6	25%	Sticks at 250 - 375°F. Melts at 500°F.	Saponified	Attacked	Not attacked by moths. Resistant to mildew
Nylon Staple	4·1 - 4·5	3·6 - 4·0	37 - 40%	42 - 46%	1·14	4·5	11%	Melts at 482°F.	Resistant	Attacked by concentrated acids	Not attacked by mildew or moths
Polyester Staple	3·5 - 4·0	3·5 - 4·0	25 - 40%	25 - 40%	1·38	0·4	3%	Melts at 480°F. Sticks at 455°F.	Attacked by strong alkalis	Resistant	Not attacked by mildew or moths

Woollen System

A variety of deniers are available for use on the woollen system, depending on whether the particular yarns are intended for fabrics, blankets, carpets or other end uses. In some cases it may be advantageous to use a blend of various deniers. "Courtelle" processes exceptionally well on standard woollen equipment, and full, soft yarns can be obtained.

Turbo Stapler

Yarns with the highest bulking characteristics can be spun from top produced by the hot-stretch, stretch-break system of the Turbo Stapler; yarns of this type are recommended in particular for knitwear. "Courtelle" is supplied in the form of 500,000 den. continuous tow for processing on this machine.

Sizing

"Courtelle" warps can be sized on all types of conventional sizing equipment. Since it is a hydrophobic fibre, a high viscosity size is normally required, therefore the size-mixing equipment must be efficient. A high-speed stirrer will normally be found necessary to obtain good mixing. To obtain the best results, the running tension between the quetsch roller and first drying cylinder should be kept to the minimum consistent with maximum efficiency; care should be taken not to over-dry the yarn.

Weaving

It is again stressed that "Courtelle" is a bulky fibre and that this bulkiness is evident in yarn and fabric form. Therefore end and pick rates may have to be reduced to produce equivalent fabrics from "Courtelle" to those from other fibres. One of the virtues of woven fabrics containing "Courtelle" is their lightness and fullness—care should be taken to bring out these properties to the full. A too tight construction will lead to a disappointing result in that the fabric will be too boardy.

If the correct construction is used, however, there are no difficulties in weaving "Courtelle" and blend yarns, and very high weaving efficiencies can be expected. "Courtelle" will have a great appeal in woven constructions, and will be found to be a very versatile fibre. The range of fabric constructions is extremely wide; it ranges from fine poplins and dress goods (produced from fine denier "Courtelle" and "Courtelle" blends) to heavy blankets and woollen cloths (produced from heavier denier material).

Knitting

"Courtelle" yarns can be knitted on flat, circular or fully-fashioned machines. Standard and "high bulk" yarns are available to the knitter. When using high bulk yarns, an area shrinkage of up to 25% should be anticipated and allowance should be made for this in the fabric structure. The knitter should work closely with the dyer and finisher to determine the correct knitting stiffness for optimum results.

In general, "Courtelle" yarns are less lively than the natural fibre yarns, and care should be exercised to obtain an even knit. Attention should be given to the alignment of needles to prevent the appearance of needle-lines. Feeders should also be set to give the maximum control on the yarn to prevent press-offs and needle breakages.

Most elastic ribs ends can be obtained with 2/2 needle set-out.

Low friction conducting ceramic guides and guide eyes are recommended. For maximum efficiency machines should be kept clean. Knitters should carry out their own experiments to establish the practice which will best meet their requirements.

Dyeing

"Courtelle" has been specially developed to dye with basic dyestuffs. It is also possible to dye with disperse dyes, which are particularly suitable for pale shades. It is dyed at the boil under normal atmospheric pressure in conventional machines and can be dyed in staple, slubbing, yarn or fabric form.

Basic Dyes—Basic dyes are characterised by their brightness and purity of hue, but their use on older fibres has been limited by their very poor fastness to light. However, on "Courtelle," specially selected basic dyes from the "Sevron" (Dupont), "Deorlene" (Ciba) and "Maxilon" (Geigy) ranges have excellent light fastness and "Courtelle" can therefore be dyed to bright, clear hues to standards hitherto unobtainable with basic dyes. These new standards of colour will have a big effect on consumer appeal.

Disperse Dyes—Like all hydrophobic fibres, "Courtelle" can be dyed with disperse dyes; used in pale shades, full advantage is taken of their level dyeing qualities. For heavy shades, the build-up of disperse dyes is not good enough for economic production: basic dyes should therefore be used.

Blends—The control of shades in dyeing blend materials, either solid or to obtain contrast effects, is easily achieved. This is because unlike most of the fibres with which it will be blended it is readily dyed with basic and disperse dyes.

Bleaching—"Courtelle" can be bleached by various methods. The method should be chosen according to the end-use and suitable recommendations can be made.

Scouring and Desizing—Conventional scouring and desizing techniques can be used for "Courtelle" and "Courtelle" blends, but treatments involving strong caustic at elevated temperatures (such as kier boiling) should be avoided.

Finishing

Modifications in technique may be necessary; the finisher should carry out experiments to obtain the desired effect before proceeding to bulk production. In wet finishes, it is advisable to avoid overstretching at high temperatures, since this will adversely affect the handle and dimensional stability of the fabric.

For the finishing knitwear, particularly high bulk, care must be taken to bring out the bulking properties to the full. Wet processing is best carried out in bags, and the load per bag should be adjusted so that the garments or fabrics are free to move during treatment. To prevent permanent creases being set in the garments, it is essential to avoid too rapid cooling after any hot treatment.

"Nylomine" Dyes for Polyamide Fibres

A NEW range of water-soluble dyestuffs, specially designed for dyeing nylon, "Perlon" and other polyamide fibres in the form of loose fibre, slubbing, yarn or piece-goods is announced by I.C.I. Ltd., Dyestuffs Division. The new dyes, of which an initial range of eight is being marketed, will be sold under the name "Nylomine." The outstanding property of these dyestuffs is said to be their ability to produce bright shades possessing high light fastness; they can also be used for printing nylon.

When applied to polyamide fibres, they not only possess high fastness to light but have good fastness to wet treatments, and by a simple "back-tanning" treatment excellent wet fastness can be achieved. Although the Nylomine dyestuffs are anionic in character they possess excellent building-up properties. Like all anionic dyestuffs they do not cover irregular-dyeing nylon and are not equal to the Dispersol and Duranol dyestuffs in this respect. Nevertheless, their behaviour on irregular-dyeing nylon is stated to be generally superior to that of existing anionic dyestuffs. They are of limited interest for dyeing acetate rayon and polyacrylonitrile fibres, but unsuitable for dyeing "Terylene" and triacetate fibre.

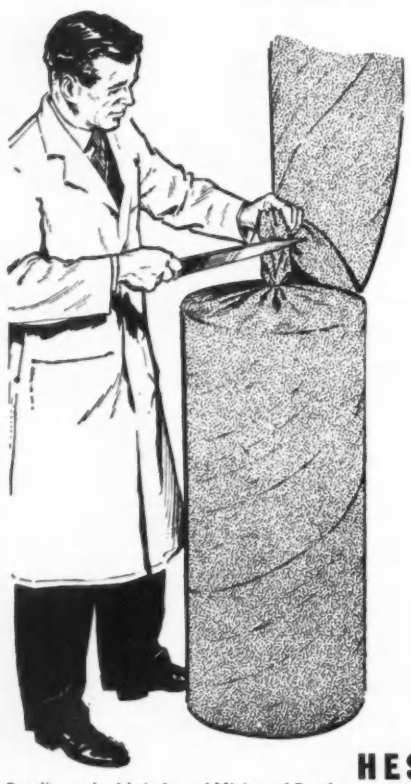
Dyeing Polyamide Fibres

The affinity of Nylomine dyestuffs for nylon is increased by increasing the acidity of the dyebath. Use is made of this property in applying these dyestuffs to nylon so that, while for pale shades a practically neutral dyebath is used, in heavier depths an addition of an acid or acid-producing salt is necessary to obtain good exhaustion of dyestuff. The dyestuffs are dissolved by pasting with cold water and then adding sufficient hot water to obtain solution. The dyebath is prepared at 40°C. (105°F.), containing the dissolved, sieved dyestuff and:—

- 0–0·2% potassium (or sodium) dihydrogen phosphate for shades up to 1·0% of single-strength dyestuff.
- 0·5–3% ammonium acetate for shades of 1% to 5% of single-strength dyestuff.
- 2·5% acetic acid (30%) for shades of more than 5% of single-strength dyestuff.

The temperature is raised, in not less than 30 mins., to 85–95°C. (185–205°F.). After dyeing for 15 mins., a further addition of acid or acid-producing salt is made, equal to the amount added at the start of dyeing. Dyeing is continued for a further 30 mins. A rinse in cold water concludes the process. The wet fastness can be improved by a simple after-treatment. A bath is prepared containing 4% formic acid (85%) and 2% tannic acid. Treatment of the dyed and rinsed material is begun at 40°C. (105°F.) and the temperature raised to 95°C. (205°F.). After 30 mins. at this temperature 2% of dissolved tartar emetic is added to the bath and the treatment continued for a further 15 mins. if the aftertreatment is carried out at 85°C. (185°F.) there is less tendency to cause dulling of bright shades, but the resulting improvement in wet fastness is not as great.

Roll it on



and roll 'em off

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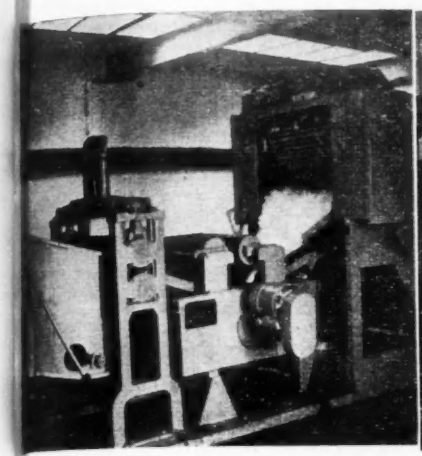
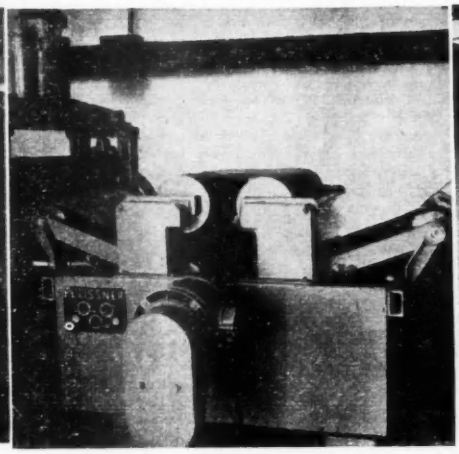
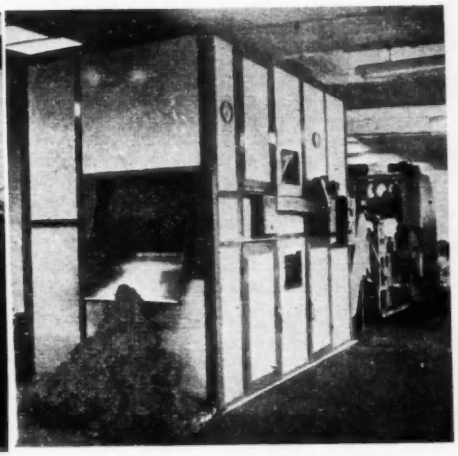


The Fleissner dyeing machine showing hopper feed for "Fibro" carpet staple



Overall view of the machine



Delivery end of the Fleissner dryer

Dyeing Loose Fibres by the Fleissner System

Brief details of a system which enables loose fibre stock to be dyed as a continuous process

AT the recent symposium held at the British Rayon Research Association by the Federation of British Carpet Manufacturers, Mr. R. C. Cheetham (Courtaulds Ltd.), referred to a new dyeing machine for the continuous dyeing of loose cellular fibres with Procion dyes by the Fleissner system. This system, evolved by I.C.I. Ltd and Courtaulds Ltd., concerns the application of cold dyeing "Procion" dyestuffs to loose stock. The process consists of:—

(1) Forming a fleece of the loose material.

(2) Impregnation of the material in dye liquor.

(3) Efficient and uniform squeezing of material.

(4) Fixation of colour.

The material is fed through a Fleissner hopper feed to form a thin continuous fleece of material which is then fed into the dyeing machine using a Fleissner patent principle of suction by liquor, and is in contact with the liquor for a period of 15 secs. The material is taken from the machine, still in continuous fleece, by mechanical means and transferred to a brattice that conveys it to the squeeze rollers.

Still in the thin fleece state, the material is then passed through the Fleissner squeezing head which squeezes the material to ensure a previously determined uniform moisture content. The amount of moisture left in the material, having been predetermined remains constant, and this enables a calculation of the amount of dyestuff applied to the material to be accurately determined. The amount of the expression determines the strength of the dye liquor used.

This material is then passed through a Fleissner wet opener which opens the material into a more open fleece which is passed forward at a slower speed into a normal Fleissner suction drum dryer. Here it is either subjected to a drying process, or a steaming process by the circulation of either hot air, or steam through the material raising the temperature to a 100°C. for a period of not less than 30 secs. This brings about a chemical combination of dyestuff and material and fixes the dye.

Depending upon the final use of the material, it is either brought from the dryer steamed or dried. Experiments have shown that it can be spun in this condition without washing-off, provided a further scouring process is to take place at some later stage in the production of the finished goods.

If, however, this material is required to be washed-off before spinning or is to be used in any process where free sodium carbonate is undesirable, then the material would be passed through a similar dyeing vessel and washed-off with a mixture of detergent and water, or other scouring agent. The material would be dried in a normal manner, thereby giving the finished product. It is stated that even after running for several hours there is no deterioration of shade or tailing provided the dye bath is kept topped up with a similar dye liquor to the original bath. The advantages claimed for this system of dyeing are:—

(1) It enables loose stock to be dyed as continuous process.

(2) Due to the fact of the small amount of dye liquor in the impregnation bath (less than 300 litres) there is very little wastage of dyestuff at the end of a run.

(3) The machine requires no skilled operatives; provided the hopper feed is kept full of material, the dyeing could go on *ad infinitum*.

(4) The labour force required is only the same as would be used for drying only, therefore cutting down wages considerably.

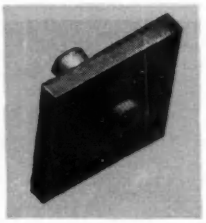
(5) The dyes are applied in a cold bath which facilitates easy handling.

(6) Because of the small size of the unit employed, relatively small quantities of material can be dyed with little or no wastage in dyestuff.

(7) The matching of a similar shade at a later date depends only on a similar mixing of dyestuff and a similar setting of the squeeze rollers. Once these are set there is no need for elaborate alterations, or final additions to bring it to shade.

It has been found, however, that on materials higher than 8 den., it is advisable to rest the material for a period of 15 mins. between impregnation and fixation, and to do this another hopper feed can be

Illustrating the extreme hardness of SINTOX Industrial Ceramic, the photograph on the right shows a ½" dia. tube of SINTOX which, without chipping, was forced through a ¼" thick mild steel plate.



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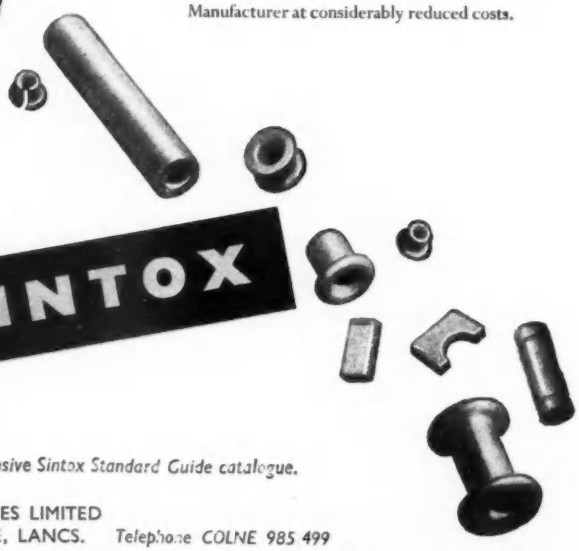

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incorporated between the dyeing vessel and the wet opener. The squeeze unit will then deliver the material into the hopper of the second hopper feed, the bottom brattice of which will move forward slowly so that it can be arranged for it to take 15 mins. before being picked up by the brattice of the second hopper. This resting period results in a 10% increase in the take-up of dyestuff by the material, and is said to give better results than any other known continuous process of "Procion" dyeing.

Further advantages of the machine are that if the material output is such that the machine is not continuously operated, the same dyeing machine can be used for scouring by replacing the dyeing liquor by scouring liquor, and passing the material through the same machine a second time for the purposes of washing-off.

It is pointed out that the Fleissner dryer is only about half the length of a conventional dryer for the same production, the inclusion of the dyeing machine and the squeeze rollers adds only about 7 ft. 6 ins. to the length of the dryer. In the majority of cases this total length of the dyeing and drying machine is less than the length of the normal conventional type dryer. Added to this is the fact that the machine can be cleaned, and the colour changed from one shade to another in less than 30 mins. Because of its special construction there is no contamination of shades.

The above range can also be used for dyeing continuous tow and sliver but, in this case, of course, the opening equipment described is omitted, and special attention is given to even squeezing of the tow. The dyeing unit itself can be adapted for scouring knitted piece goods, a further illustration of the versatility of the Fleissner rotating drum, which can be incorporated either in a drier or in a range for wet processing staple, sliver, tow or piece goods. Technical details of the mixing of the dye liquors, may be obtained from I.C.I. Ltd., and details of the mechanical application to this system may be obtained from Fleissner and Sohn, or their agents.

New Approach to Spinning and Allied Processes

IN recent experiments at Shirley Institute, cotton fibres had been made radioactive by suitable treatment to enable research workers to follow them inside the card and to find out what happened to them. So far, only preliminary experiments had been conducted, designed to test the potentialities of the method, but even so some useful information had been obtained, said Mr. A. E. De Barr, B.Sc., F.Inst.P. (Head, Spinning Department, British Cotton Industry Research Association) in a recent lecture to Manchester and District Section of the Textile Institute.

Analysing the reasons for the lack of significant new developments in spinning techniques, Mr. De Barr said he did not think the conservatism of the industry was mainly to blame; nor did he believe there was any stock of unadopted ideas of major importance lying around waiting for the industry to take up. In spinning, as in drafting and carding, practice was well ahead of theory, he continued. Textile machinery of 100 years ago must have been among the most advanced in design and construction of any machinery anywhere, and although the same could not be said to-day, at recent textile machinery exhibitions there were signs that the engineering design of textile machinery was recovering lost ground.

What intrigued the newcomer was that much of the progress had come about in spite of the astounding lack of information about the nature of the physical processes involved. In carding, for example, did anybody know why short fibres and trash tended to be retained preferentially on the flats instead of being carried forward into the sliver? Quite a lot was known about the relation between what went in and came out, but almost nothing about what occurred inside. Scientists were always tempted to attribute sluggish progress to a lack of fundamental knowledge of the mechanism involved, in which connection Mr. De Barr did not believe that the scientific approach, i.e. an approach based upon prior understanding of the mechanism of the process, had yet its full influence upon cotton spinning. What he did believe was that once science had been able to catch up with the empirical techniques considerable advances would be possible.

Developing this argument the speaker suggested that perhaps the time had come to stop trying to improve the traditional method of processing. In spite of shortcomings these might be nearly perfect so that a disproportionate amount of effort would be required to improve them. If we were to see any appreciably progress in the near future it was probably necessary to start thinking along entirely new lines. On the other hand, many minor improvements could be made in such things as, e.g., the standard of maintenance. In his opinion, this was lower in the cotton spinning industry than anywhere else. He also found a general reluctance to accept new machinery or gadgets which required a certain delicacy and precision in handling.

Research in the spinning industry differed from that in other industries in that such a large proportion of the work done was concentrated in the research associations. On the whole the attitude of the cotton industry to research had been good; Shirley Institute had been able to carry out a great deal of fundamental work. In spinning, progress had been slow because any research association in planning its programme had to carry the industry with it. What the industry had to realise was that the old methods were likely to be capable of only slight improvement and this at a great cost. "For my part I should like to see the research associations given a full and free mandate to prepare a complete development plan for the future of the industry," Mr. De Barr said.

To do this it would be necessary for member firms to be prepared to forego some or all of the service work now being done for them, and above all to have confidence that a 20th century spinning industry could be something well worth having. It should also be recognised that changes in the method of production in the spinning industry were linked up with the question of textile education. In the not-too-distant future, said Mr. De Barr, this industry would be making increased use of electronics, automatic control systems, possibly even nuclear science. As the technologists of tomorrow, the students of today would be called upon to work with these things, not necessarily as experts, but as users of these techniques.

Portable Paint Kit

THE V 2579 touch-up kit, manufactured by Alfred Bullows and Sons Ltd., Long Street, Walsall, has been specially designed to meet the need for a compact, portable unit which will allow a range of colours to be sprayed easily by one operator, with a minimum loss of time in changing the colours.

As will be observed from the illustration the equipment incorporates a L/910 spray gun with seven aluminium cups of 5 ozs. capacity, six cups being used for colours and one for thinners. There is a built in reducing valve, a suitable length of hose, and the whole kit is mounted on a caster based trolley which can be easily trailed around the shop by the operator from job to job or as required.

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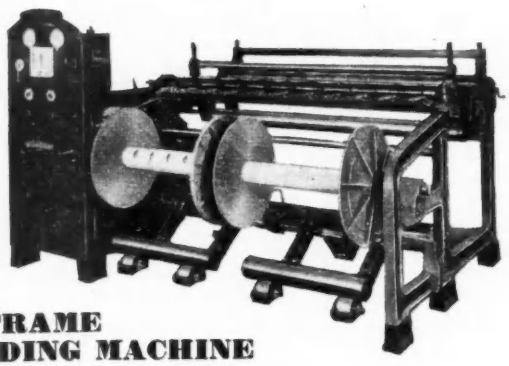
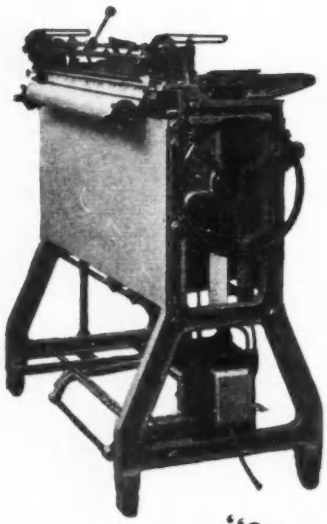


Tube frame threaded with the spool in its spring holders; eliminates four operations (patents pending). Needles re brought forward by simple foot operated switch, leaving operatives' hands free to attend to interrupted ends and return to thread by the same operation. Tube frames can be threaded as fast as removed from the chain, th s facilitating immediate return to their last position in the chain. All needles have rounded crochet hook ends, preventing yarn damage and enabling smoother threading. All spool end strive difficulties overcome, enabling 100% threading even if strive is as much as 1" by our new full length comb. By fitting side supports the standard 4/4 machine can thread 2/4 to 16/4 Tube frames, or a machine can be supplied 12/4 in width. Tube Frame automatically clamped eliminating still a further hand operation.



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Textile Trade and Prospects

Cotton Yarns and Cloths

A slight hardening in raw material prices at the beginning of December resulted in some quick adjustments to American-type yarn prices ranging from ·25 to 1·75d. per lb. The reshuffle had its reactions in that a little more business was negotiated, some buyers fearing that the changes might be only the beginning of more, although on the surface, there was nothing to warrant this assumption. On the whole, yarn buying has been much firmer these last few weeks and in some lines the off-take has been quite good. Inquiry has covered practically every count and quality available but the turnover still leaves much to be desired. Moderate weights of standard weaving qualities have been put through in medium and coarse numbers in ring yarns. Bolton-type doubling wefts have had a little more support but these show little sign of improving to anything like the volume that could be accommodated if the demand did receive some stimulus. Hosiery qualities are being absorbed a little better with steady business in certain blended yarns and speciality single and folded varieties. On the export side, a few more lots were booked for continental markets.

In cloth, prices have been reasonably firm but manufacturers complain that the margins on some types are "cut-to-the-bone" in order to secure the work. Interest in many Lancashire cloths has been lukewarm with little opportunity to improve the situation. Few buyers have displayed any eagerness to jump in and, in instances, where some stock gap has had to be filled, the emphasis has been on early delivery. Less is heard just now of unreasonable complaints as a preliminary to cancellations or compensation but it is still a weapon which some resort to when the market changes in an adverse manner.

Most of the available business has been in a wide range of apparel cloths. Dress fabrics in dobby, jacquard, screen and machine printed designs have been in fair request, cotton and spun rayon sharing a large part of the cloths in request. Nylon and "Terylene" examples have been well supported and would, undoubtedly, fetch much more business if prices could be lowered still further. Shirtings in orthodox and novelty designs move rather sluggishly but it is hoped re-stocking following Christmas buying will result in more activity in these cloths. Furnishing fabrics in rayon warp, cotton weft, dobby and jacquard designs—traditional and contemporary—have been accorded a reasonable measure of support. Colour and finish plays an extremely important part in this field. Household textiles follow the same steady tone with quite a lot of interest in the very neat and colourful lines now available in packed towel, etc., sets in presentation cases. Business in roller towelling is almost negligible but medium priced, colourful and well-designed hand and bath towels with condenser pile find ready markets. Most of the business booked has been on home trade account. Export markets show little sign of improvement. Modest transactions have gone through for two or three continental outlets and a few lines for Eastern and Commonwealth countries. The fact that imports into this country from the East continue to pour in causes much worry in trading circles.

Linen Trade Review

With Christmas bookings disposed of, quiet conditions now prevail in all sections of the trade and little improvement is anticipated before the turn of the year. Day to day transactions are barely sufficient to absorb production and prevent a build-up of stocks, which manufacturers and merchants are endeavouring to keep within reasonable limits in view of the proximity of stock taking.

With increasing appreciation of the importance of the price factor to consumers, spinners and weavers are concerned as to the best means of solving it to the satisfaction of both parties. Progress made with re-equipment in recent years has raised the standard of efficiency in some concerns to a degree that leaves little opportunity for effecting economies in direct manufacturing costs, except through shift working, which introduces further complexities. The greatest opportunity for success would seem to lie in a reduction in material costs. Being now almost entirely dependent on Continental markets for their flax supplies British manufacturers—although the principal buyers—have little control on the price level, which producers can manipulate to their own advantage in view of the limited supplies available.

There are, however, many establishments in which output efficiency still falls far short of that possible. Many contributory factors could be cited, including unbalance of plant, lack of co-operation between sales and production personnel to ensure the most efficient use of available plant, unwillingness to break with established practice in order to develop new techniques and products. Failure by management boards to enable men being trained for executive positions to obtain a broader outlook and experience to that available in individual concerns is frequently responsible, as is also lack of vision in the boardroom.

Latest reports from the various flax markets indicate quiet conditions. Spinners are limiting their purchases to immediate requirements and, it would seem, are disposed to defer purchasing for stock until later in the season. Merchant houses are also adopting a cautious attitude with the result that supplies on scutchers hands are accumulating. Prices generally are firm, although occasional bargains are had from scutchers compelled to realise for financial reasons. Good quality fibre is in short supply again this season, despite the fact that it has been a best seller in recent years, and has shown the widest margin of profit to the producer. New crop Russian Slanetz flax is on offer at around £135 per ton, c.i.f. U.K. Old crop fibre is quoted about £3 per ton less.

The "Review of the Linen Industry," just published by the N. Ireland Ministry of Commerce, provides much useful information on development trends, in addition to a mass of statistical data relating to raw material sources and supplies; yarn and cloth production; analysis of exports; and the markets supplied. An ominous feature of the data relative to exports is the progressive decline in quantity of piece goods and thread, and the upward trend of flax line and tow yarn exports, particularly the former, of which a considerable volume comprises high grade yarns for suiting drills, etc. Bearing in mind the current demand for technicians to staff overseas plants to manufacture these quality yarns it is obviously only a matter of time until this trade—the most lucrative in the spinning end—is lost. Increasing diversity of production in the weaving section is evidenced by the fact that, of the total loom state cloth production in 1956 approximately 58% was classed as linen and union, 10% cotton and cotton/rayon mixtures, 28% rayon (spun or continuous filament), and 4% classified as "other materials."

The continued inroad of man-made fibre materials into linen markets is evidenced by the production of nylon table damasks and bed sheets. This fibre has also largely replaced flax for the manufacture of fishing lines, and in some types of sewing threads. The production of yarns from appropriate nylon staples on standard flax preparing and spinning equipment, presents problems which are not insoluble, so that much of this trade could still be retained by the spinning section.

Man-made Fibres and Fabrics

Business during the past month has been quiet but in some areas the startling decline compared with twelve months ago gives cause for anxiety in view of the prevailing unsettled conditions at present. On the whole the position is difficult and complex in view of the rising imports of foreign cloth which, although mainly cotton, are affecting the sales of cloth made from man-made fibres. Another disturbing factor is the rising imports of Continental made-up garments which, if not in the "cheap" price range, sell largely on novelty, although in some cases prices are extremely competitive. Business in Lancashire manufacturing circles remains fairly static with far too many looms idle but one or two concerns report order books in a healthy state for a reasonable distance ahead. Demand for rayon dress fabrics has eased up and in negotiations the main emphasis is on special finishes. Furnishing fabrics are in reasonable request in the speciality and novel design range in both woven and

Wood engraving by John Farleigh

Best-seller in Bamboo

AFTER BEING SHIPWRECKED on the first of his three voyages round the world, Captain William Dampier found himself, in May 1681, fighting his way across the Darien Peninsula. Through mosquito-clouded forests and crocodile-infested swamps, the doughty captain, who was diarist as well as discoverer, clung to his one possession—a length of bamboo. "Foreseeing a Necessity of wading Rivers," he relates, "I took care before I left the ship to provide myself with a large Joint of Bamboo, which I stopt at both Ends with Wax. In this I preserv'd my Journal and other Writings, tho' I was often forced to swim." Deservedly, the Dampier Diaries proved to be best-sellers.

Foreseeing the necessity for protecting their merchandise on the highways and the seaways of the world, modern manufacturers take care to use cartons of 'Thames Board', and 'Fiberite' cases in solid or in corrugated fibreboard. These are fitting protection for products that deserve to be best-sellers.

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printed cloths. Smart designing plays a very important part in attracting buyers and British firms are paying considerable attention to this.

The Yorkshire trade is probably as active as any with "Terylene" playing an important part in many of the cloths at present being woven. Blends of "Terylene"/wool have been very well received and this might to some extent explain the good reception which "Terylene"/cotton blends are receiving from the Lancashire trade. The spinning of these blends in Lancashire has accelerated a certain amount of advance orders particularly for shirtings and for a variety of other products also. It is thought that the export field will be a specially important one in view of the lead which Lancashire has obtained over her European competitors with blends of "Terylene"/cotton.

Blends of man-made fibres on the woollen system is a steadily increasing trend and another comparatively new industry in the north of England—tufted carpets—is absorbing increasing quantities of man-made fibres and yarns. Future prospects in this sphere of activity appear extremely bright for some considerable time ahead.

Activity in many of the traditional products of the Macclesfield/Leek areas is limited at the moment but throwsters report a high demand for bulked yarns. The trade is still not producing all that is required, and this is an indication of the demand for these fibres from knitters. The smallwares industry is rather slack at the moment and narrow fabric manufacturers have probably had one of the leanest Christmas buying periods since the war. Makers-up are finding that demand is tending to "level-off" and although nylon and "Terylene" tricot fabrics are in request they are not moving as fast as in recent months. Sewing thread manufacturers report steady trade and interest has been shown by firms in blends of "Terylene"/cotton sewing threads which are claimed to be the answer to the problem of making-up the fabrics made from synthetic fibres. Weavers in the Macclesfield area are only moderately employed and printers—machine and screen—could do with more orders. Commission dyers and finishers are fairly well booked-up. In the Midlands, demand exists for most of the established products, and in men's half-hose there has been plenty of repeat buying, but the call for ladies' hose has not been what was anticipated,

Jute Fibre Yarns and Fabrics

The raw jute market has been quiet in Pakistan and a noticeable feature has been the reduction in the price of Tossa. Offers of crack marks of Tossa-2/3 have been scarce this season and high prices have resulted. At the end of November offers were £125 to £130 per ton, but by the first week in December there were sellers willing to accept £114. To a lesser extent the same applies to grade Tossa-2/3 with sellers willing to accept £102 10s. c.i.f., U.K., Dec./Jan. shipment.

This has made the raw material position irregular and there is a considerable price difference between sellers. The position in Pakistan does not appear to warrant this sudden drop in values but it may arise from some sellers viewing the market and taking a risk to attract buyers.

U.K. spinners have been purchasing quantities about equal to their cut-up during the past month. Buying has been selective with spinners not always purchasing the lowest priced marks. Although shipments from Pakistan this season have been kept more up to date than last year, spinners are careful which shippers they deal with because of past experience. Although offers of Tossa are now more freely made there has not been much improvement in the quantities available of higher grades of white jute. It is possible however that more offers of Mill Firsts and crack Hearts will be made.

Mill Firsts are available at £112, but the general price asked is £2 to £3 per ton above this. Mill lightnings are at £96, Mill Hearts £86 and grade Hearts at £76 10s., c.i.f., U.K., Dec./Jan. Grade Tossa-2/3 has been reduced to £102 10s. and Tossa-4 to £96. Crack Daisee-2/3 has been sold at £96 10s. and grade Daisee-2/3 at £89, c.i.f., U.K., Dec./Jan. Total sales of raw jute by East Pakistan this season are lower than in the same period last year, but actual exports are greater. Last year at this time shipments were running late and spinners had to cover the shortages by purchasing either spot or afloat fibre at a considerable premium.

The Calcutta goods market has become easier and this downward trend continues. So far as U.K. buyers are concerned the quantities purchased have not been large and mainly hessians. The price of imported Asiatic jute goods is now based on the f.o.b. rates and has no connection with the cost of Dundee made cloth. As a result, the price difference between Calcutta goods and Dundee cloth has widened. This, of course, applies to weights and widths for sack making purposes.

Quotations for Calcutta goods have been reduced to 60s. for 10 oz. 40 in. and to 46s. 6d. for 7½ oz. with 11 oz. 45 in. at 68s. 3d. per 100 yds. f.o.b. Calcutta for December shipment. "B" twills were quoted at 164s. 5d. December. Demand for Dundee yarns has been poor with business confined to small quantities for early delivery. Due to the credit squeeze and the high bank rate consumers are only purchasing immediate requirements and this may continue as long as supplies are available for quick delivery. The only bright feature in the yarn end of the trade has been the steady offtake of supplies by the carpet industry. This has helped spinners specialising in this yarn to keep production at reasonable levels. The linoleum trade has taken regular deliveries but demand for weaving qualities has been poor.

The cloth position has been quiet. At present circular looms appear to be better employed than flat looms. In the heavy end of the trade demand for sackings and tarpaulins has been poor and most descriptions can either be obtained from stock or for delivery two to three weeks forward. The continued easier trend in raw material values has not helped to improve demand for yarns and cloth as consumers are already looking for a reduction in prices. This is inevitable if raw jute prices continue to fall.

World Wool Activity

Commonwealth wool-growers have overcome many of the difficulties of drought, floods, bush-fires and sheep diseases to make more wool available on world markets. In doing so they have added substantially to the economic stability of their countries. Despite drought and lower prices, Australia's wool cheque for the period July/Oct., 1957 was more than £A 114 million, an increase of £A 11 million on the corresponding part of 1956. This was due to increased output, the number of bales sold rising by 159,000 to 1,250,000. The average price of 72d. per lb. was more than 2d. per lb. below the average for the opening months of last season, but this decline was more than off-set by the larger quantity sold.

In New Zealand, wool receipts for the twelve months ended October 31 were £110 million, a rise of £14·6 million on the previous year. But for this increase, the country's trade deficit of £14·2 million would have been considerably greater. South Africa's wool income rose by nearly £20 million during the 1956–57 season, according to final figures issued by the South African Wool Board this month. Wool sold totalled 302,310,000 lbs., compared with 296,489,000 lbs. in the 1955–56 season. Receipts were £72,265,000 in 1956–57, compared with £52,843,000 in 1955–56. Drought in South Africa has become increasingly severe, and this is now having an adverse effect on the wool clip. In September and October this year the amount of wool sold showed a drop of 20 million lbs. compared with the corresponding months last year.

According to the Commonwealth Economic Committee, wool consumption in the free world for the July to September quarter, 1957 was 3% higher than in the corresponding quarter last year. Compared with the April to June quarter this year, consumption declined by 9%, but this was due largely to the seasonal influence of annual holidays. The total amount of wool used by the free world during the July to September quarter was estimated at 452 million lbs. (clean). The daily rate of consumption appears to have fallen slightly between the second and third quarters of 1957. Western Germany and Italy both used more wool during the third quarter than in the second. France, the U.K., the U.S., and Japan all used less. Daily rate of wool cloth output in the July to September quarter, in the chief manufacturing countries, appears on the average to have risen slightly when compared with April to June, but in combing and spinning it is estimated that the daily rate has fallen. An encouraging point in the committee's report is that output in practically all countries during the first nine months of the year was above that of the corresponding period of 1956. The U.S. was the outstanding exception.

Wool consumption and top production rates in the U.K. during October were appreciably lower than in September and also lower than in October, 1956 year. The rate of wool consumption was 7% lower than in September and 8% below that of a year earlier. In topmaking, wool consumption was 11% below October, 1956, and in woollen manufacture 4% lower. Worsted yarn delivery rate in October was slightly higher than in September but 4% below 1956. In woven wool fabrics the delivery rate was 5% lower than in September and 10% down on October last year. Blanket output was 3% lower. October production figures were: Wool consumption, 41·49 mill. lbs. (clean weight); top production, 26·92 mill. lbs.; tops drawn, 20·13 mill lbs.; worsted yarns delivered, 21·94 mill. lbs.; woven wool fabrics delivered, 35·01 mill. sq. yds.; blankets delivered, 3·52 mill. sq. yds.

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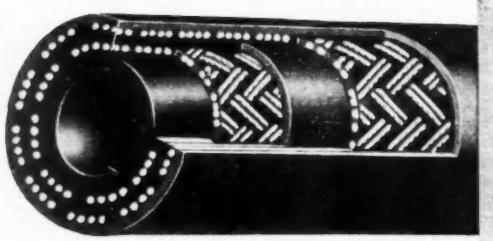
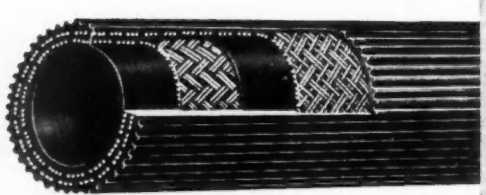
Light in weight and of balanced construction, Goodyear Long Length Air Hose is easy to handle and resists kinking. There are two types of this hose—Style A and Style B, both available with smooth or corrugated covers.



STYLE A *for service where oil mist may be present in the line, and where operating pressures up to 325 lbs. per sq. in. are used.*



STYLE B *for general, light and medium pneumatic tool service and working pressures up to 210 lbs. per sq. in.*

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Notes and News

Design Library

The newly planned design library of the Cotton Board's Colour Design and Style Centre which was reopened recently is a visual one: assembled to provide everchanging sources of stimulus for producers, textile designers and students. The library is first concerned with creative design. The Centre believes that many of the most striking of Lancashire's design achievements have come as a result of the employment of first class British artists.

The content of the Library, more than eight hundred volumes, has been selected over seventeen years to provide sources of inspiration and design reference on all visual subjects likely to be of importance to the creative textile designer: in this respect its content is unique. More than 100,000 fabric samples assembled since the inception of the Centre and collections of historic textiles add to its range.

A general view of the reading room at the Colour, Design and Style Centre of the Cotton Board

Correction

We draw the attention of all readers to the article "Mechanical Properties of Decrystallized Cotton " ("T.M.," Nov. 1954, page 582) in which an important acknowledgement was inadvertently omitted. The article was originally issued in 1953 by the Headquarters Quartermaster Research and Development Command, U.S. Army, Natick, Massachusetts, as "Technical Series Report No. 79," and was an account of the work carried out by Dr. George Susich, a member of the staff.

We regret any inconvenience caused by this error to both Dr. Susich and the U.S. Army Quartermaster Corps Research and Development.—Ed.

Overdrafts for Australian Wool Shipments

All Australian trading banks have increased from 6 to 8% the interest paid on overdrafts used to ship Australian wool overseas. The new rate came into operation December 2. A spokesman for Dalgety and Co. is reported to have said the increase might deter some of the major buying organisations in Australia from shipping wool on speculation to the U.K. and the Commonwealth. These organisations, he said, had sent wool overseas on their account to help their overseas clients who could not get credit. The operations of these buyers had strengthened the Australian wool market at crucial times when prices were falling.

U.K. Carpet Industry

Recent Board of Trade figures show that sales of British carpets are now higher than at this time last year and the industry reports order books are well filled for both home and overseas trade. A good demand from the home trade and a marked improvement in exports are the two main reasons for this increased activity. Australia and New Zealand, two important markets, are now absorbing more carpeting, due partly to an easing of import restrictions and partly to greater public demand. For certain grades of carpet there is a fairly strong demand in the U.S. and Canada, plain Wilton being one of the chief exports.

Australia continues to be the best customer of all for U.K. wool carpeting. Floral patterns are most favoured, in bold colours on a grey background. Pastel shades, popular in the U.K., are considered less effective in the bright sunshine and clear light of Australia and New Zealand. According to B.o.T. figures, the index for carpet sales rose to 120 in October, compared with 118 in September, and it is expected that sales during the three months September to November will be at a higher rate than in the corresponding months last year. The index is based on the figure of 100 for the average in the year ended November 1954.

Nylon at Britain's Textile Show

British Nylon Spinners Ltd. are taking part in two of the exhibitions which constitute the 1958 Britain's Textile Show at Earls Court, February 17–21. The entire B.N.S. display will be devoted to "new texture" nylon shirts, mostly made from "Taslan" textured nylon or schappe spun nylon. Schappe spun nylon will be shown for day shirts in white and a variety of plain colours. "Taslan" textured nylon will be shown in white, plain colours and stripes for day wear and in checks and prints for sports wear.

Growing interest in nylon for household textiles will be reflected by the B.N.S. display of sheets, carpets and some of the first nylon upholstery fabrics. "Fitted" or "contour" sheets made from knitted nylon which are easy to wash, quick to dry and need no ironing, will be shown in an even greater range of colour combinations. In addition, there will be traditional-style woven sheets, some made from 100% spun nylon and others from blends of cotton-and-nylon. Carpets will include traditional Wiltons woven from blends of wool-and-nylon and tough, hard-wearing tufted carpets, some of them with an all-nylon pile and others with a pile composed of blends of viscose-and-nylon.

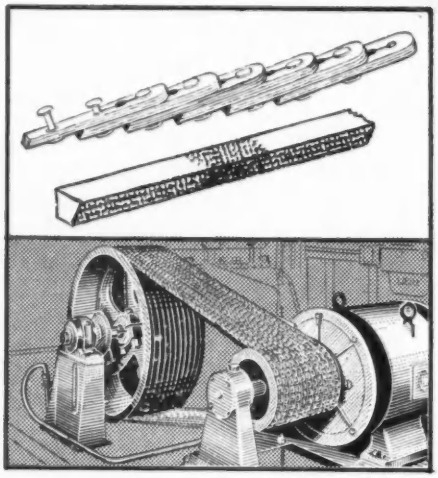
"Acrilan" in Lancashire

Possible uses of "Acrilan" in the Lancashire trade, as a complement to its present use in the worsted and woollen fields, were outlined by Mr. D. W. H. Galbraith (sales manager, Chemstrand Ltd.) in a recent talk to the Converters Sections of the Cotton and Rayon Merchants Association in Manchester. He stressed the need, in a rising economy, for fabrics with greater performance and serviceability and went on to explain ways in which "Acrilan" can provide fabrics with these qualities. Listing the fields in which it has already achieved trade and consumer acceptance in the U.K., he continued by saying it would receive similar acceptance in the Lancashire trade for dress materials, baby clothes, shirtings, sheetings, etc.

New South Wales University of Technology

The first school of textile technology at university level in the southern hemisphere began providing undergraduate courses in February 1957 at the New South Wales University of Technology, Sydney, Australia. After a first year basic science training, students are able to choose from one of four options, viz., textile manufacture, textile chemistry, textile physics, and

the end to endless trouble



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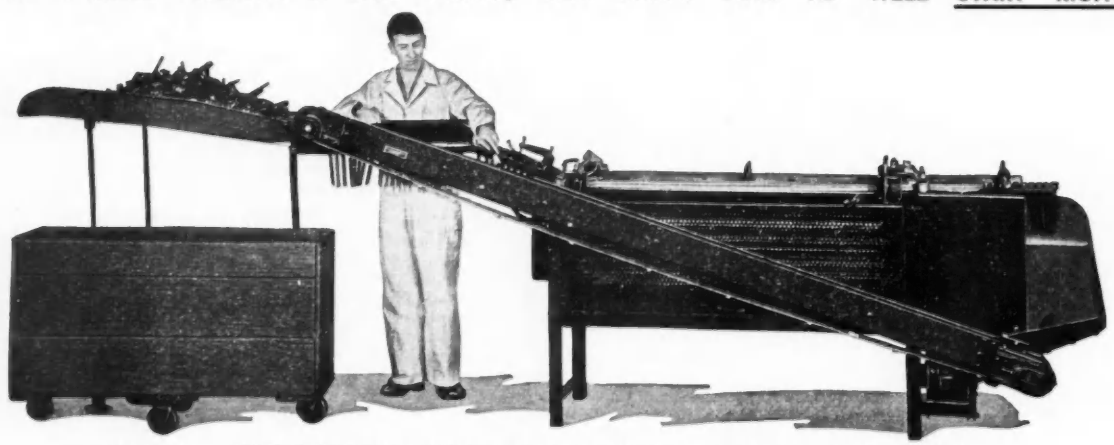

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A semi-automatic installation is now available for the large mill.

textile engineering. Each course leads to the B.Sc. (pass and honours) after four year study. Compulsory subjects in the humanities and six months' industrial training are integral parts of each course. The academic staff consists of: Prof. M. Chaikin, Head of the School (textile physics and textile engineering); Associate Prof. A. Johnson, Head, School of Textiles, Easy Sydney Technical College (fabric manufacture); Dr. A. Datyner (dyeing and finishing); Dr. C. H. Nicholls (textile chemistry); Mr. F. Wood (textile testing); Mr. A. Dircks (yarn manufacture). The textile industry has donated six scholarships and the Wool Research Committee of the Commonwealth Government two scholarships, providing students with emoluments of approximately £500 per annum. The school at present occupies a number of physical and chemical laboratories within the main University block and plans are proceeding for the completion of a new building in 1958 to instal a wide variety of textile processing machines.

Textile Institute Honours

Fellowship of the Textile Institute has been awarded to Mr. A. J. I. Harding, M.Sc., F.R.I.C. (dyeworks director, Fosse Dyeworks Ltd., Leicester), and Mr. C. Shrigley, A.T.I. (head of textile department, Technical College, Oldham).

New Mill for Israel

From Israel, Barclays Bank D.C.O. reports that the Moller-Dee Textile Corporation, in conjunction with the Histadrut, is to invest I£3,500,000 in a spinning mill of 10,000 spindles in Kiryat Shimona in upper Galilee. A new rayon factory is also to be built at Ashdod Yam. Scheduled to start next October it will at first manufacture rayon from imported raw material and later from local material. It is hoped that in about five years the factory will produce sufficient rayon cord to supply the entire needs of the Israel tyre industry.

A.T.I. Examinations 1958

The Textile Institute announces that the dates for the 1958 Associateship Examinations are: Part I—Saturdays, April 26 and May 3, 1958; Part II—Friday, April 25 and Saturdays, April 26 and May 3, 1958.

1958 Mather Lecture

Mr. W. English, M.Sc.(Tech.), F.T.I., who will deliver the Textile Institute Mather Lecture for 1958, has chosen the subject, "A History of Winding." The lecture will be in Nottingham in April after the annual general meeting of the Institute.

COLLINS' TEXTILE DIARY. Collins Clear-Type Press, London and Glasgow (price 5s. 3d. net).

Maintaining its excellent reputation, the 1958 edition of this very useful pocket diary, provides executives, managers, overlookers and students, etc., with a mass of valuable information usually only found in a range of text books and other publications of a textile nature. No section of the entire industry has been ignored as regards the data systematically set out and the personal diary section is four days to a page. Postal and other information is also included.

Duke Opens College Extension

"Without scientists and technologists, industry, medicine, nuclear power, defence and rockets would soon 'shrivel and disappear'," said H.R.H. the Duke of Edinburgh, on his recent visit to the Manchester College of Science and Technology to open the new extensions of the college. "Without them," he went on, "our days in a modern civilised state with a reasonable standard of living would be numbered. In the past many of our leaders had not been to a university, but on the other hand we could not afford any longer to leave it to chance to produce our scientific leaders. We are certainly going through a difficult period just now, but I firmly believe that the stock of talent, skill and ability, which has flowered so often in the history of these islands, is as great as ever," he said. Three requirements for the success of the college were given—(*a*) help and co-operation from industry in terms of money, equipment, and part-time teachers; (*b*) industrialists who would demand people with the proper qualifications and give them jobs which exercised their talents to the full and (*c*) understanding of the importance of science.

Prince Philip unveils a plaque to officially open the new extension of the Manchester College of Technology. Also in the picture is Dr. Bowden, principal of the College

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New Companies

Windmill Rug Co. Ltd. Private. Reg. in Dublin July 9. Capital £20,000 in £1 shares. Rug, pile fabric, fur fabric and cloth manufacturers, etc. The subscribers are: George A. Wagstaff, Coolree, Wexford, works manager; and Valentine S. Demery, 30 Thorncliffe Park, Orwell Road, Rathgar, Dublin, manufacturers' agent.

John F. Quinlan and Co. Ltd. Private. Reg. Dublin July 9. Capital £10,000 in £1 shares. Winders and doublers. Derek Wade, of Golcar, Yorks., is permanent director.

M. Kriegsfeld Ltd. Private. Reg. Nov. 18. Capital £1,000 in £1 shares. Manufacturers and dealers in cloth, wool, worsted, etc. Registered office: 48/50 Mosley Street, Manchester 2.

Weavex Ltd. Private: Reg. in Dublin June 25. Capital £5,000 in £1 shares. Spinners, manufacturers, dealers in woollen, cotton, plastic or other synthetic or textile fibres and fabrics, etc. The subscribers are: Walter P. Maquire and Walter Beatty, solicitors, both of 62-3 Dame Street, Dublin.

Dawson Textiles Ltd. Private. Reg. in Dublin June 27. Capital £5,000 in £1 shares. The subscribers are: Edward J. Montgomery, solicitor, and John P. Hooper, solicitor's apprentice, both of 63 Dawson Street, Dublin.

M. Monks and Co. Ltd. Private. Reg. Nov. 11. Capital £15,000 in £1 shares. Manufacturers and dealers in plastic materials, felt, cotton, woollen, rayon and silk materials and goods of all kinds, etc. Registered office: 10 Rutland Avenue, Walton, Warrington.

Julie Brown (Fashionwear) Ltd. Private. Reg. Nov. 12. Capital £1,000 in 1,000 shares of £1. Manufacturers and dealers in worsteds, yarns, etc. Registered office: 48 Grosvenor Street, Manchester 1.

Bolton Textile Mill Company Ltd. Reg. Nov. 14. Capital £375,000 in 5s. shares. Cotton spinners and doublers, flax, hemp and jute spinners, etc. Registered office: Campbell Street, Farnworth, Lancs.

Lammermuir Fabrics Ltd. Private. Reg. Nov. 26. Capital £5,000 in £1 shares. Manufacturers and dealers in wool, worsted, silk and any other fibrous substances, etc. Registered office: Martins Bank Chambers, Tyrrel Street, Bradford 1.

Windle and Whittingham Ltd. Private. Reg. Nov. 26. Capital £3,000 in £1 shares. Cotton spinners, etc. Registered office: Ridgway Mill, Mill Brow, Earby, Yorks.

John Maude and Sons (Stainland) Ltd. Private. Reg. Nov. 26. Capital £40,000 in £1 shares. Woollen manufacturers. Registered office: Bankhouse Mills, Stainland, near Halifax.

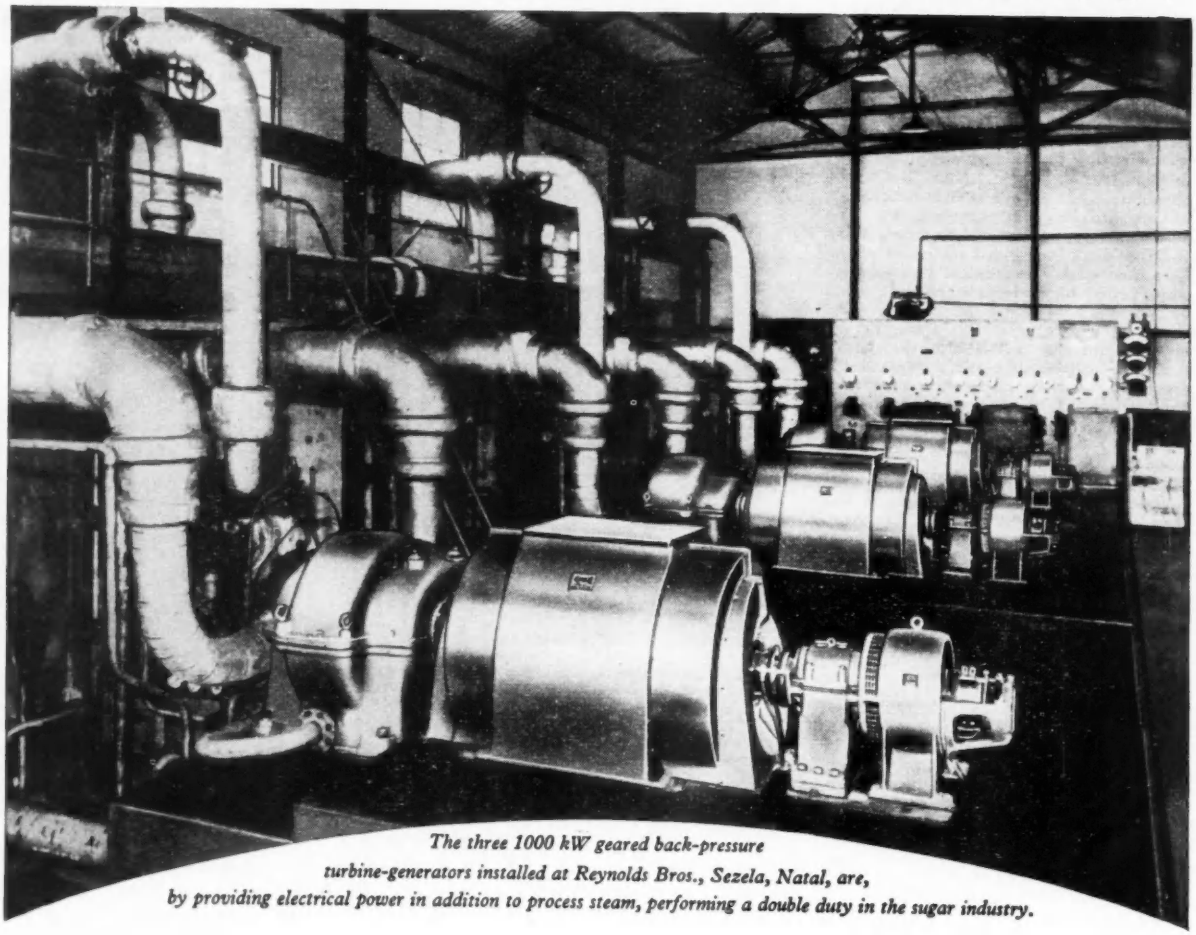
Otto Goedecke (U.K.) Ltd. Private. Reg. Nov. 29. Capital £2,000 in £1 shares. Importers, exporters, dealers, spinners and weavers of cotton, wool, jute and all kinds of natural and artificial fibres, etc. The subscribers (each with one share) are: Eric W. de Figueiredo, 19 Old Hall Street, Liverpool 3, cotton broker, Sydney M. Caldwell, 318 Tower Building, Water Street, Liverpool 3, chartered accountant.

Heseltine and Gray Ltd. Private. Reg. Nov. 29. Capital £40,000 in £1 shares. Top makers, wool and hair merchants, etc. Registered office: 25 Sunbridge Road, Bradford.

Mancravat Ltd. Private. Reg. Dec. 4. Capital £1,000 in £1 shares. Manufacturers, importers and dealers in wool, worsted and other fabrics, etc. Registered office: 196 Deansgate, Manchester 3.

F. and H. Field Ltd. Private. Reg. Dec. 5. Capital £3,000 in £1 shares. Cotton waste dealers, flock manufacturers and dealers. Registered office: Willow Mill, Cowhill, Chadderton, near Oldham.

Geared Back-Pressure Turbines–



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–cut your fuel costs

Great advantages can be gained by installing small back-pressure turbines for heating and process steam requirements in large factories. The back-pressure turbine is relatively cheap to install, occupies little space and requires only light foundations.

When Metropolitan-Vickers first installed one of their own back-pressure turbines at their Trafford Park Works in 1948 the cost of power and heating requirements for the factory were reduced by over £9,000 a year.

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RECENT TEXTILE PATENTS

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760,985 Fixing Comber Needles

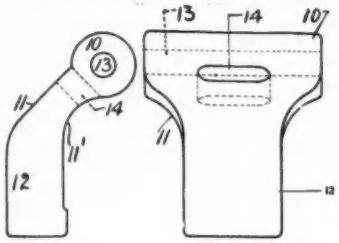
STAEDTLER AND UHL, 12 *nordliche Ringstrasse, Schwabach, Bavaria, Germany.*

A device for fixing needles in combing machines. A needle holder has needles embedded in it, the needle holder being formed of a material which is capable of being moulded and which also forms adhesive means whereby the holder may be mounted directly upon its carrier.

761,073 Over-Pick Looms

R. HRDINA, 245 *Knightsbridge, London.*

A picker for looms fitted with an over-pick motion, which will not damage the pirns or the pirn changing motion. The picker is a solid body made of leather or other suitable material, shaped to provide a cylindrical top 10 and a part offset from the top. This offset part comprises an inclined part 11 and a lower part 12

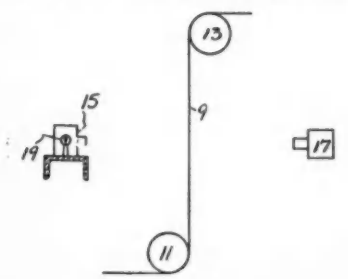


rectangular in cross-section. The top part is bored to provide a bore 13 for mounting the picker on the spindle above the shuttle box. The inclined part 11 is formed with a slot 14 having inclined side walls to receive the strap. The continuous bore in the part 10 provides a light but strong construction, and the inclined front wall 11^1 of part 11 enables the picker to move past the pirn magazine without coming into contact with the pirns or any part of the pirn changing motion.

761,437 Improved Shearing Machine

SELLERS AND COMPANY (HUDDERSFIELD) LTD., *Engine Bridge Works, Chapel Hill, Huddersfield.*

Material 9 passes over rollers 11 and 13 between a light source 15 and a photo-electric cell 17. The arrangement is such



that with the bulb 19 lit a ray of light is projected on to cell 17 unless it is interrupted by anything passing between the two. In operation the bulb is lit so long as the machine is working and the cloth passes between the light and photo-electric cell thus preventing operation of the latter. When there is a gap such as a joining in the material the light from the bulb reaches the photo-electric cell and causes operation of the cell. The current which is passed by the cell is amplified and passed through a time delay device to a switch causing the stopping of the motor driving the cutter.

761,472 Card Dust Collecter

D. HOWORTH AND SON LTD., 213 *Halifax Road, Rochdale.*

A suction clearer for carding engines comprises a pipe close to the taker-in roller and a second pipe close to the doffer cylinder both pipes being divided into passageways opening at intervals along the length of the pipes. Trunking connects one end of each pipe to a suction fan by which dust fly and loose fibres are delivered to a collecting chamber from which the air escapes through perforations, and baffles on the pipes direct dust and fly to the suction openings.

761,827 Beams for Warp Knitting

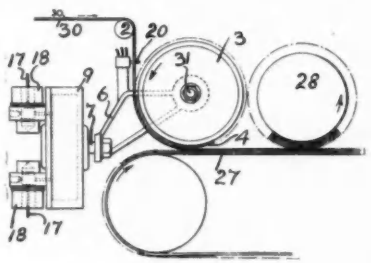
P. SCHÖNFELD, 65 *Annaberger Strasse, Karl-Marx-Stadt, Germany.*

An improved beam for flat warp knitting machines, etc., has a slot extending along its entire length. By this arrangement, the beginning of the fabric strip may easily all be inserted at once into the slot in the beam and clamped.

761,851 Cloth Guiding Device

JOHN DALGLISH AND SONS LTD., *Thornliebank Industrial Estate, Thornliebank, Glasgow.*

Improved device for automatically guiding travelling fabric. Fabric 30 passes over a drum 2 and is then controlled by a wheel 3 to be guided to the pins 27 of a



stenter. The wheel has pins 4 to engage the web along a narrow area near an edge. The axle 31 for the wheel is mounted on a frame 6 carried by a spindle 7, the axis of which is coincident with the plane of the fabric as it leaves the pins 4 and becomes engaged upon the pins of the stenter. Spindle 7 carries a vane in a housing 9, air under pressure being led to either side of this vane to deflect the same in one direction or the other, and thus deflect the frame about the axis of the spindle 7, whenever the edge of the fabric makes contact with a finger 20 adapted to energise one of a pair of solenoid coils 18, the armatures of which carry valve rods 17 operating air control inlet and exhaust valves on either side of the vane on the spindle. A brush wheel 28 may be provided for assisting the impelling of the fabric upon the pins of the stenter.

761,887 Improved Loom Beat-Up

BRITISH CELANESE LTD., *London.*

A method of weaving fabrics on a flat loom in which a reed mounted on an oscillating sley is used to beat-up the weft into the fell of the fabric and in which the part of the reed engaging the fell of the fabric during beat-up is close to the ends of the reed wires, where the reed wires are supported in the reed. Positioning of the reed at beat-up is effected by a movement of the reed in the direction of its wires derived from the forward motion of the sley.

761,929 Improved Hand-Threaded Shuttle

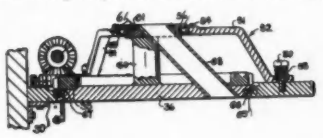
T. DAWSON (SHUTTLEMAKERS) LTD., *Vernon Street, Blackburn.*

Describes hand threaded shuttles with improved shuttle eyes. The eye is formed of porcelain, being round or of a rounded oblong shape. A transverse hole is formed in it with a vertical slot of less width than the diameter of the hole leading to it and the end of the eye at one side of the slot is inclined to lead the yarn to the slot and at the other side of the slot projects beyond the inclined portion.

761,962 Card Coiler Mechanism

IDEAL INDUSTRIES, INC., *Bessemer, Gaston, North Carolina, U.S.A.*

An improved coiler head mechanism for drawing frames, cards, etc. The coiler plate 30 has mounted on it studs 50 which penetrate the free ends of spider legs 51 of a coiler mounting spider 52. A compression spring 53 is between the head of



each stud and the ends of the spider legs. The spider also comprises a hub 54 fixed to the spider legs and in which is mounted the outer race 55 of an anti-friction bearing which has an inner race 56. The outer race is secured in position in the hub 54. The coiler guide base 36 has rising from

it a central shaft 60 which has a hub 61, and the race 56 is secured to the periphery of the hub. The springs 53 permit upward movement of the coiler guide with spider 52 when the can has been filled and the contents press the plate 36 upward. The plate 30 has a circular groove 65 spaced from the opening 66 and the base 36 has a circular rib 67 which has rotation in the groove 65. The hub 61 has a tube 68 extending at an angle and passing through the gear 35, which is fixed to the base plate 36 and this pipe also passes through the plate.

762,211 Shuttle-changing Mechanism
E. A. BUTIN, 73 *Cours Vitton, Lyons (Rhône), France.*

A shuttle-changing mechanism for looms having a system of cams and levers for the disconnection between the shuttle box and the batten, together with the opening of a section of the shuttle box. In the mechanism the camshaft and the lever controlling shaft are both carried at the lower part of the loom frame so that they do not reciprocate. This arrangement leads to a reduction in the inertia of the moving masses.

762,280 Improved Pickers, etc.
W. R. BROOKSBANK, *Embsay Tannery, Skipton.*

Improvements in the means of securing pickers to the picking straps of overpick looms. The picking strap is secured to the picker so that the axis of width of the strap does not lie parallel to the axis of the spindle over which the picker slides. There is no twist in the strap in the vicinity of the picker, and the strap is secured to the top of the picker by a clamping plate fixed to the picker.

762,324 Selvedge Mechanism for Shuttleless Looms
L. TURNER AND CO. LTD., 35 *Grange Lane, Leicester,* and J. H. EATON.

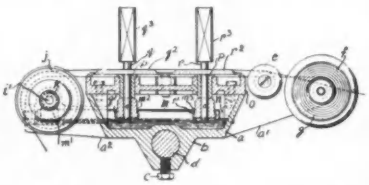
A shuttleless loom is equipped with a selvedge mechanism having means driven so as to move a bobbin of selvedge thread in one direction of rotation through a circular path about an axis transverse to the warp shed, and in the vicinity of the fell, of the loom. The bobbin is moved at a rate correlated with the rate of reciprocation of the weft laying arm, thereby to pay out a selvedge thread which engages the picks of weft and binds them at opposite side of the fabric.

762,403 Dust Removal on Cards
BRITISH COTTON INDUSTRY RESEARCH ASSOCIATION, *Shirley Institute, Didsbury, Manchester.*

A method for reducing dust and fly liberation, at the open part of a carding engine. In the apparatus, high air pressure in the region of the junction between the cylinder and the flats at the taker-in end, and in the region of the junction between the cylinder and the doffer cylinder, is prevented by continuously exhausting air directly from these regions whilst the engine is in operation. The apparatus also includes means for exhausting the dust laden air from both regions.

762,617 Yarn Waxing Machine
W. AYRTON AND CO. LTD., *Gorebrook Ironworks, Longsight, Manchester.*

Describes an improved waxing machine for yarns or threads. The body of the machine is made in two parts, part *a* having a lug *b* with clamping screw *c* by which it is fixed to a rod *d* on a winding machine. Part *a* has an extension a^1 to carry a porcelain guide bush *e* and a tensioning device consisting of discs *f* loaded by a spring *g*. An extension a^2 has a bush *i* in which is journalled a spindle carrying a pulley *j* and a worm *k*. In part *a* is a shaft *m* mounted on pins *n* and having a worm wheel m^1 complementary to the worm *k* and a pair of worm portions m^2 and



m^3. In the part *o* are bushes *p* for spindles *q* and *r* which at their lower ends carry worm wheels q^1 and r^1 complementary to the worms m^2 and m^3. The spindles carry discs q^2, r^2 and have flat-sided extensions q^3, r^3. Wax cakes having flat-sided holes are placed on the spindle extensions and the tensioning device and the friction of the thread on the discs and waxes provides enough tension to enable the thread to drive the pulley, probably assisted by the torque generated at the discs and waxes themselves.

762,619 Fibre Blending Machine
T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

B.P. No. 706,043 describes an arrangement in which fibres contained in each of a number of measured-rate delivery units is fed to a conveyor by metering elements constituted by a pair of rollers provided with plain fluted surfaces. It has however been found that such rollers are not always capable of exerting sufficient restraint on the material passing between them to prevent the passage of an unduly large tuft. This disadvantage is avoided by the substitution for at least one of the fluted metering rollers by a roller having a covering of metal wire, card clothing, etc., such as to present to the material a closely spaced assembly of teeth or spikes to retard the passage of the material.

762,806 Card Tape Condenser
SPINNBAU G.m.b.H., 201 *Farger Strasse, Bremen-Farge, Germany.*

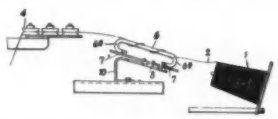
Describes a tape condenser constructed as a self-contained unit separate from a carding engine, with a conveyor for conveying web from the carding engine to the tape condenser. The latter has at the middle a dividing device, with tapes engaging rollers, and at the sides rubbing and winding devices. The condenser comprises a middle frame disposed at a lower level than the adjacent end of the conveyor, and carries the dividing device with tapes, tensioning devices and tape return rollers. The side frames, carrying the rubbing and winding devices are detachably arranged at opposite sides of the middle frame.

763,030 Screen Printing Machine
VEB TEXTILMASCHINENBAU ZITTAU, 15 *Gerhart-Hauptmann-Strasse, Zittau, Germany.*

Relates to a screen printing machine having a printing base moved on intermittently from one point to another, and stop means for adjusting the printing base in relation to the screen printing points. On an endless band running at the side of the printing base there are pattern repeat stops capable of fine adjustment, which set the screen carriages to the correct position and bring about stoppage of the printing base. In this way an exact pattern overlap is ensured, without special attention by an operator.

763,366 Feed Motions for Crepe Yarn
FRAS. HINDE AND SONS LTD., *St. Mary's Silk Mills, Norwich.*

A method of transferring highly twisted untensioned yarn between supply and delivery points in winding. From the reel 1, the weft 2 is loosely fed to twin-disc tension plates 4 and from the tension plates, the thread is led to a weft layer. To prevent untwisting or snarling of the yarn a glass rod 6 is interposed between



the reel and tension plates and the thread is given a number of turns around the rod in a direction reverse to the twist already in the thread. The rod 6 has each end 6*a* curved back under the rod into a U-shape, the free rod ends being secured, by clips 7, to a support plate 8. The support plate is secured by a pivot 9 to a bracket 10. For purposes of adjustment, the plate 8 can be turned about the pivot 9 so that the rod is located either in alignment with a straight feed path for the thread or at an angle to the feed path.

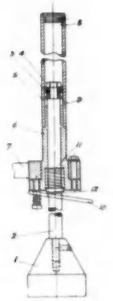
763,421 Narrow Fabric Loom
C. DEVAUD, *La Marliere, Collonge-Bellerive, Geneva, Switzerland.*

A method of weaving a band, in which weft threads, forming a loop, are inserted successively between the warp threads, by means of a needle, the end of the loop being held by an auxiliary thread supplied in proportion to the weaving and passing through each loop of double weft. The auxiliary thread is engaged in each loop of the double weft by pulling, by a hook, the loop of double weft fed through the warp by the needle and causing it to pass around a cop carrying the said thread. A slight return movement of the needle is produced before the loop of double weft is engaged by the hook, so that the double weft is loosened for engagement by the hook. At least two adjacent warp threads are closed whilst the needle is still in engagement with the warp threads, in such a manner that, during its withdrawal the point of intersection of the weft and the selvedge thread, moved by the needle, comes against these two warp threads in the tensioned position, to obtain an alignment of the points of intersection of the weft and selvedge thread.

763,521 Sliver Can Packing
FAIRBAIRN LAWSON COMBE BARBOUR LTD., *Wellington Foundry, Leeds.*

Can packing device for the packing of slivers into cans. A packing head 1 fixed is to the end of a rod 2 which bears a washer 3 attached to its end, and the washer and rod slide in a cylinder 5. The latter is fixed to a member 6 carried by an arm 7 which is oscillated vertically by a drive from a suitable machine. Two small air leakage holes are provided at 8 and 9 in the

side of the cylinder 5. The rod is surrounded by a catch plate 10 which allows the rod to move upwards relative to the arm 7, but binds against the rod to prevent down movement. This is ensured by means of spring 11 and collar 12. When the drawing frame is brought into operation, sliver flows from the machine into a can located beneath the weight 1. As the sliver increases in the can, the weight packs the sliver and rises slightly, the catch 10 holding the shaft as it rises bit by bit relative to the arm 7. When the can is full, shaft 2 has risen to its fullest extent so



that the nut 4 is nearly at the top of the sleeve 5. At this point, the full sliver can is removed. The weight must now be allowed to drop to its lowest position and this is effected by raising the catch 10 by hand, thus removing the locking action. The weight and rod fall under the effect of gravity but the rate of fall is checked and retarded, since the washer 3 draws air through the hole 8 and ejects air through hole 9. The rod therefore descends slowly, its fall being such that no impact is produced when the rod reaches the lowest part of its travel.

763,537 Yarn Tensioning Device

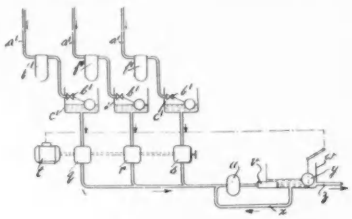
MIRA ZAVODY NA PLETENE A STAVKOVE ZBOZI, NARODNI PODNIK, 16 *Ctiradova, Prague XIV, Czechoslovakia.*

A tensioning device for yarns, comprises a drum, rollers co-acting with the drum and mounted free to rotate and to move towards and away from the drum, and magnetic means which urge the rollers towards the drum. If the distance between the rollers and the drum increases due to a thicker portion of the thread, the magnetic force acting upon the rollers will be reduced and an even tensioning will result all the time.

763,599 Applying Emulsions to Jute, etc., Fibres

D. FRASER AND SONS LTD., *Westburn Foundry, Arbroath, Angus, Scotland,* and DON BROTHERS, BUIST AND CO. LTD., *St. James Road, Forfar, Angus, Scotland.*

An installation for the preparation of emulsions for application to jute or other bast fibres. Three liquids are supplied under gravity head through pipes a^1, strainers f^1, and ball valves b^1 to cisterns c^1. The cisterns maintain a constant low head over proportioning pumps *q,r,s,* one or more of which may be fitted with a variable delivery device, and the pumps are driven indirectly from a common motor *t*. The liquids pass to a pressure pump *u* supplying a homogeniser *v* in a cistern *w*. The capacity of pump *u* exceeds the combined outputs of pumps *q,r,s,* and the difference is made up by re-circulation through a pipe *x*. The cistern *w* contains a float switch *y* which controls the pumps *q*, *r*, *s*, and may also control the pump *u*. When the cistern *w* is nearly empty, the float switch starts the pumps *q,r,s,u*, which fill the cistern *w*, stopping when the cistern is full. The

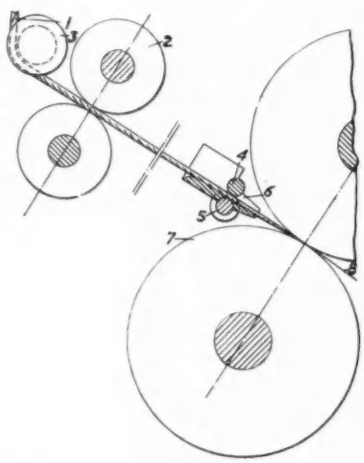


output of the pumps *q,r,s*, must exceed the maximum demand by the process machinery. The speeds of the pumps *q,r,s*, are variable relative to one another so as to provide for establishment of the phase-volume ratio of the emulsion.

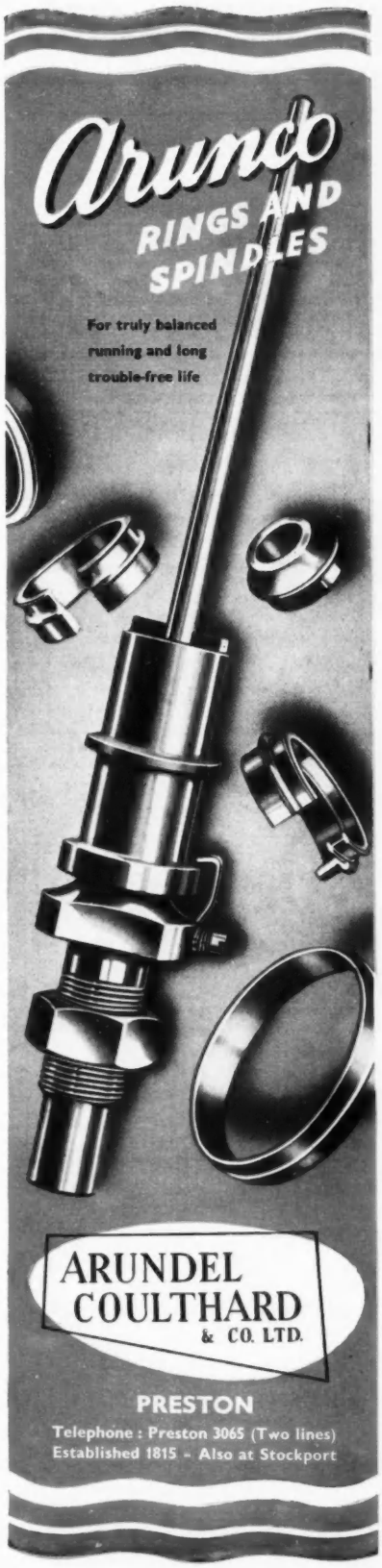
763,653 High Drafting System

AMBLER SUPERDRAFT LTD., *Wheatley Works, Ben Rhydding, Ilkley, Yorkshire.*

Improved drafting of fibres in the manner described in B.P. No. 696,882. In the example the rovings 1 are of 64's quality wool and each has a weight of 25 drams per 40 yard length. The rovings each have an initial twist of 0·7 turns per inch in the same direction and are led from supply bobbins to the nip of a pair of feed rollers 2 by a fixed guide 3 having a concave



periphery of a width such as to lead the rovings side by side to the feed rollers. The rovings then pass in contact with each other to the nip of a pair of tension rollers, the lower roller 5 being flanged and the upper roller 4 fitting between the flanges. The rovings then pass through a flume 6 to the nip of drafting rollers 7, from which they pass in the form of a single yarn 8 to the bobbin of a cap-spinning device. The drafting rollers 7 apply a draft of about 130 to produce from the two rovings a single yarn of 48's counts. It is found that mutual resistance to rotation of the two rovings maintains adequate twist for coherence during drafting, and yarns of good quality can be produced at drafts of the high order mentioned.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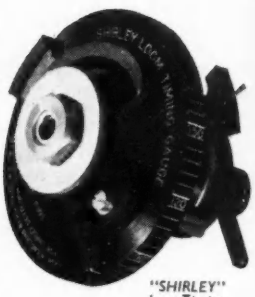

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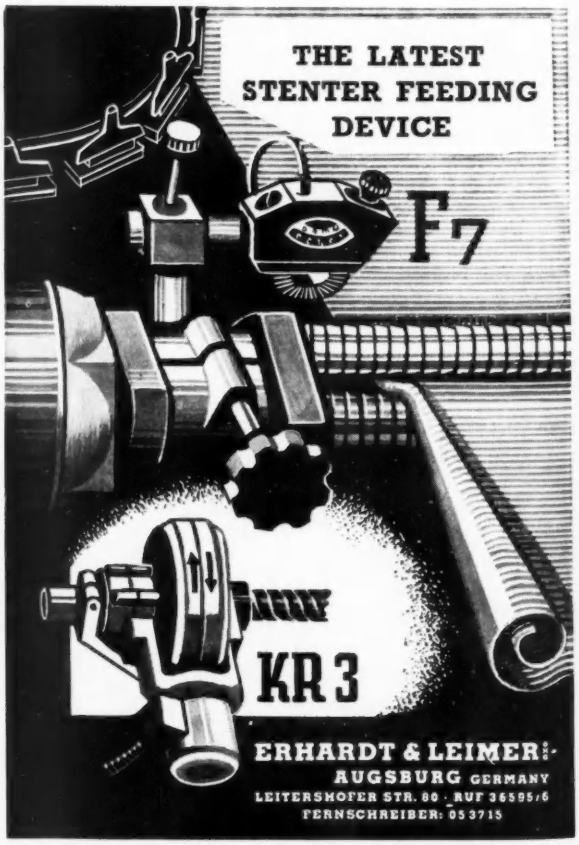

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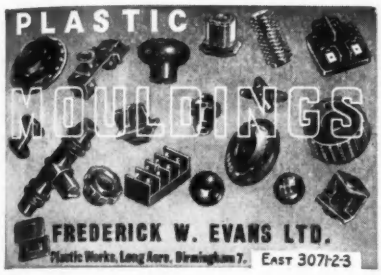

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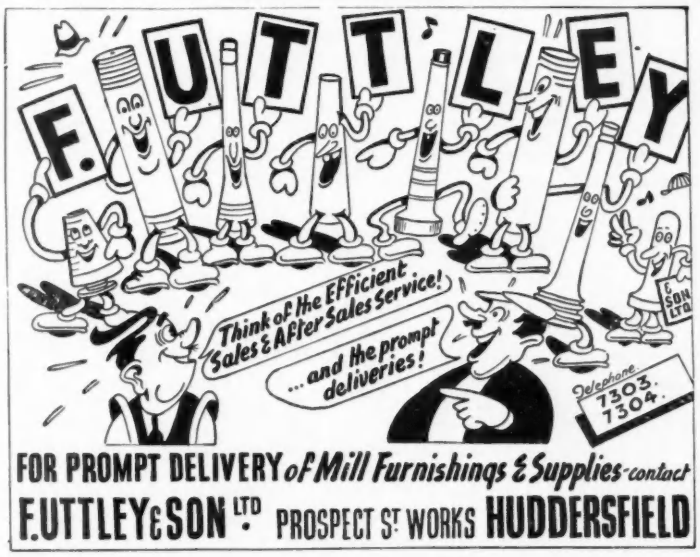
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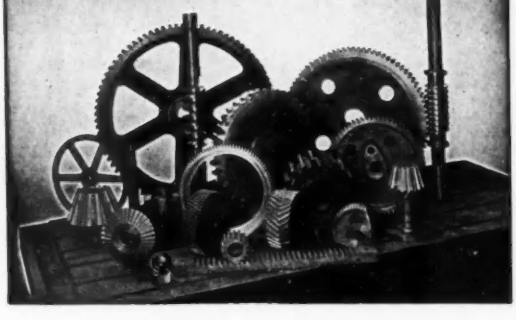

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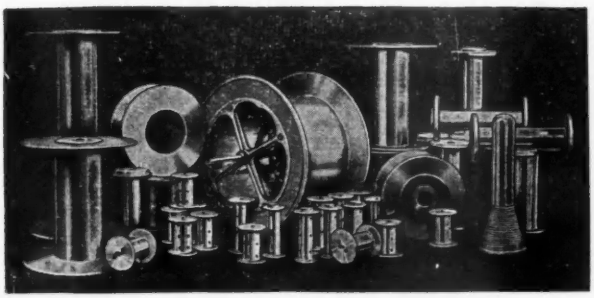

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in specially suitable aluminium alloys

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We have many special designs of warp beams to suit the specific requirements of every kind of fibre and cloth. Our patent, positively locked flange beams resist the end pressure of the warp, and eliminate any possibility of " soft warp ends."

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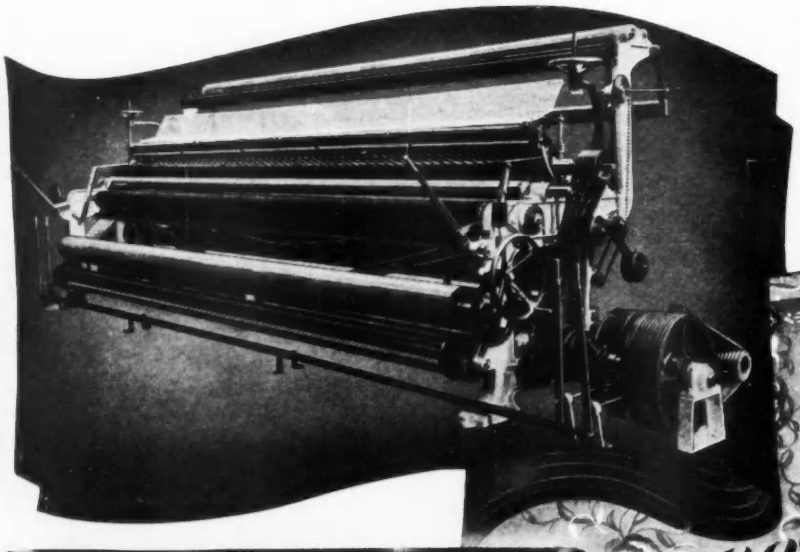

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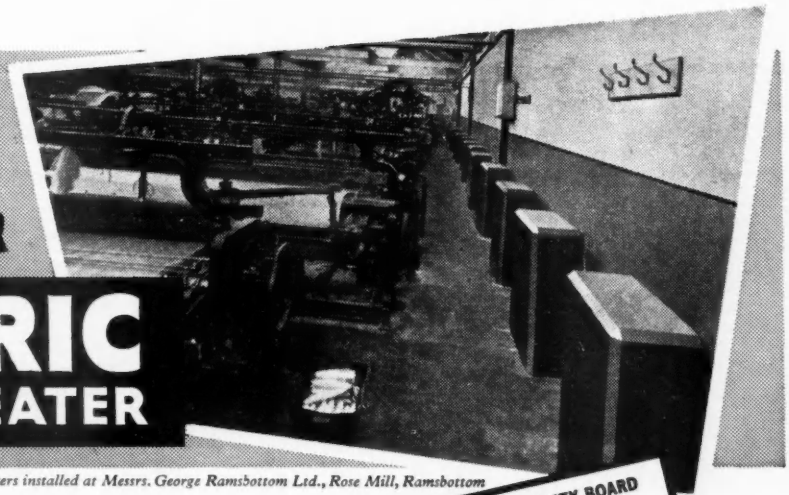

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I should like further information on ELECTRIC STORAGE HEATERS

NAME .....

ADDRESS .....

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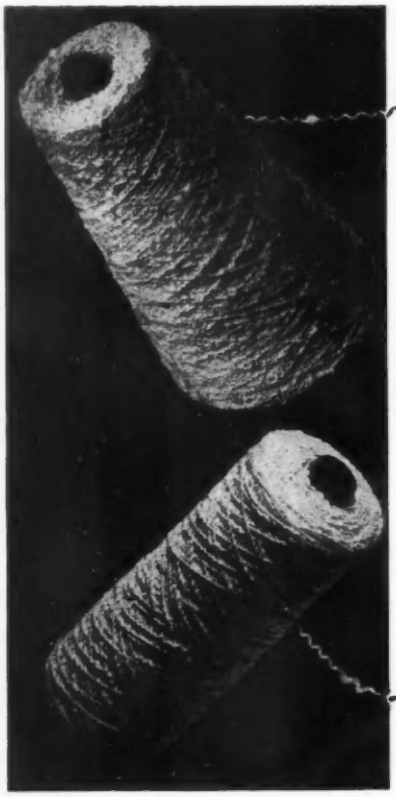

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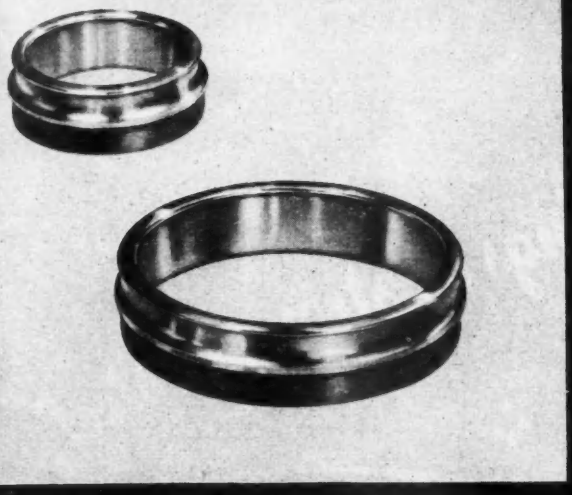

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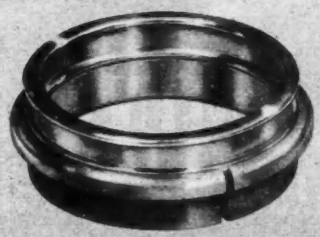
RINGS



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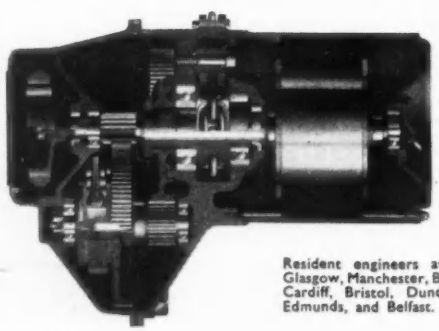

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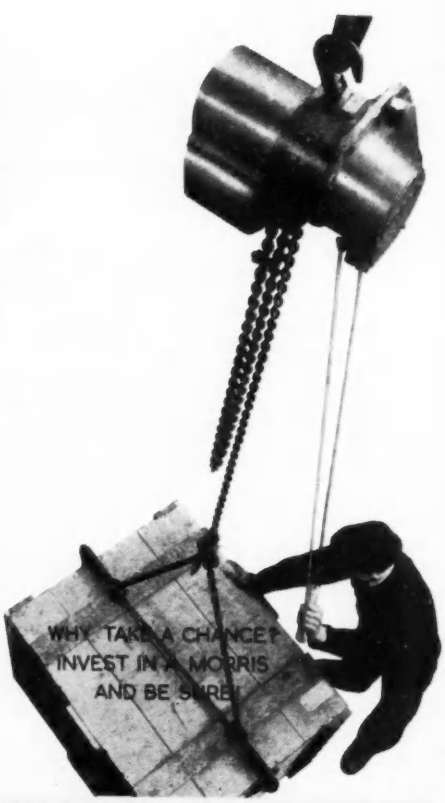

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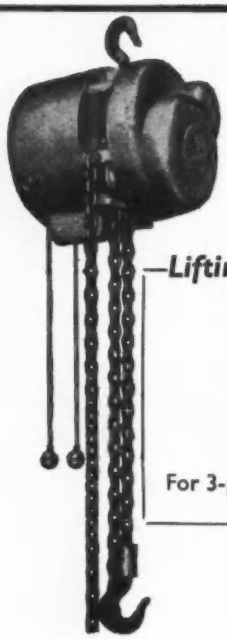

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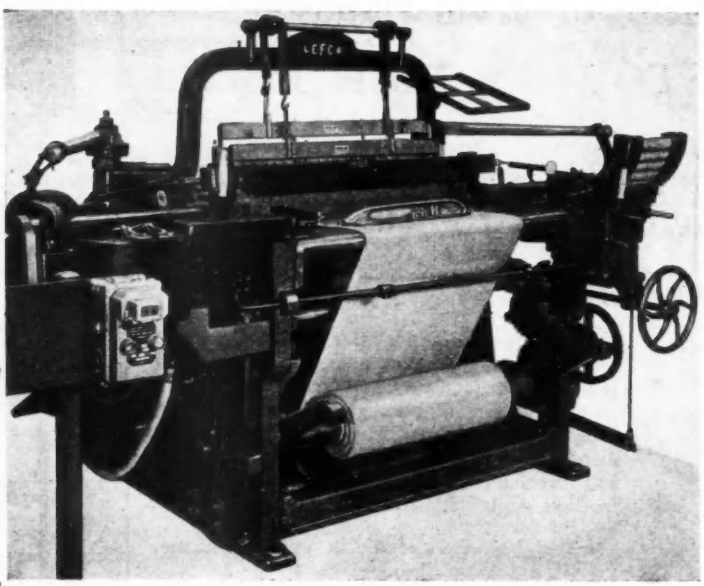
extractor type, solid cop, shuttle loader.

A further development of the famous "ECCO" Loader



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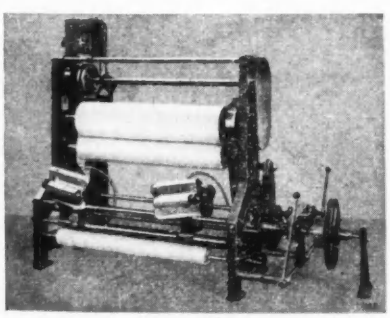

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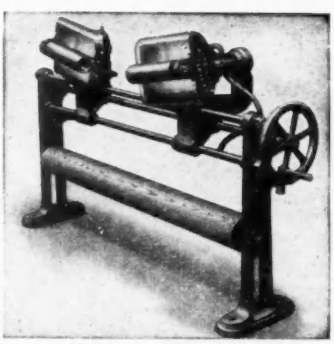

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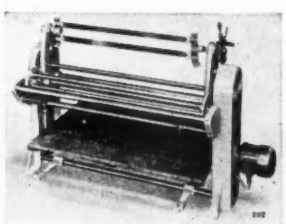

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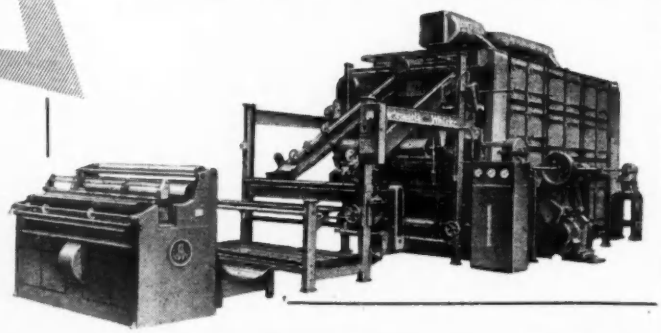

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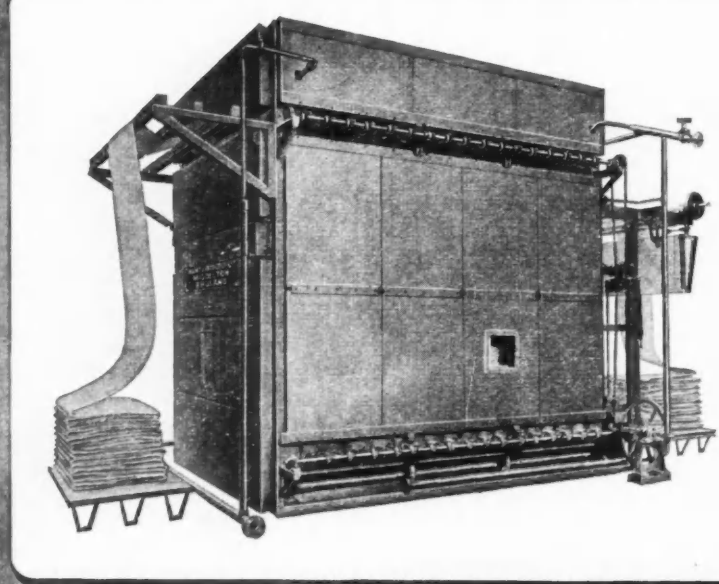

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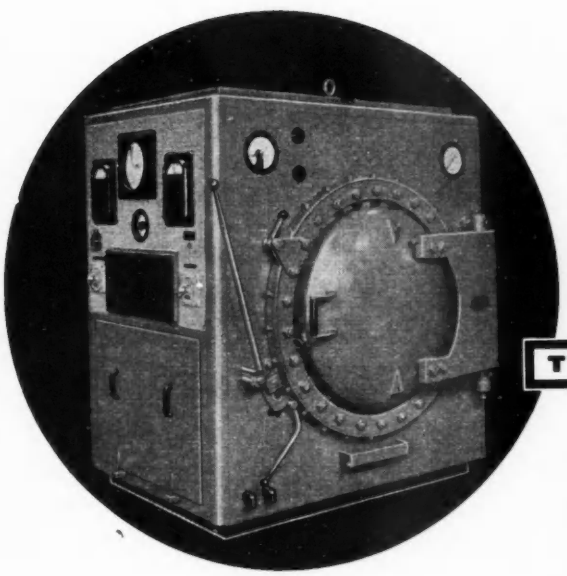

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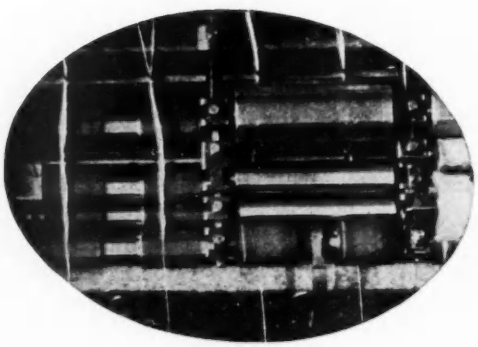

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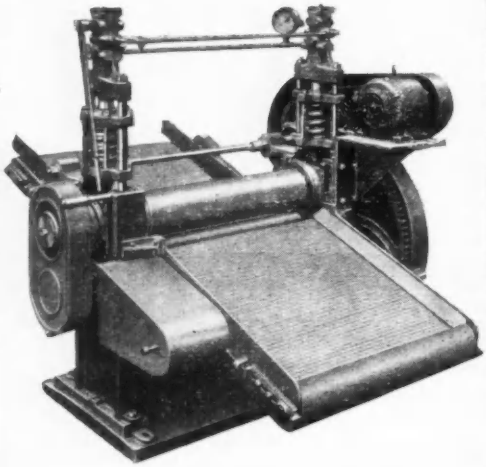

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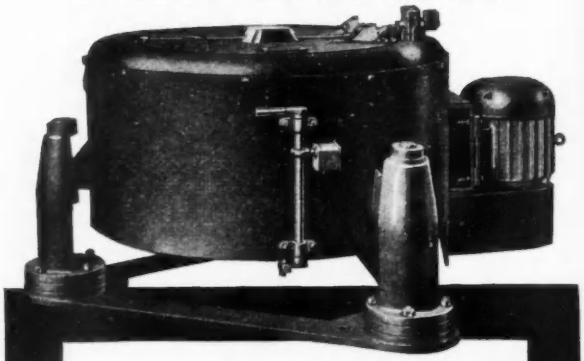

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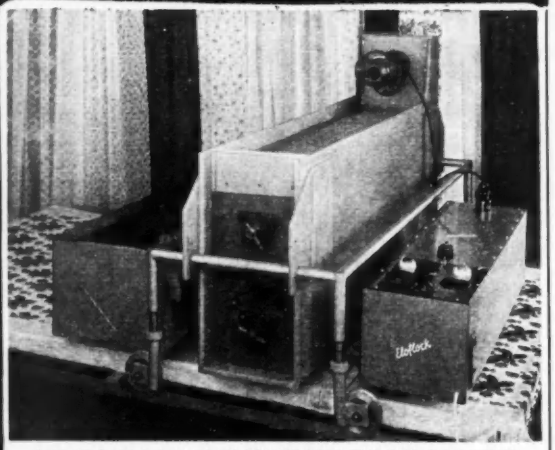

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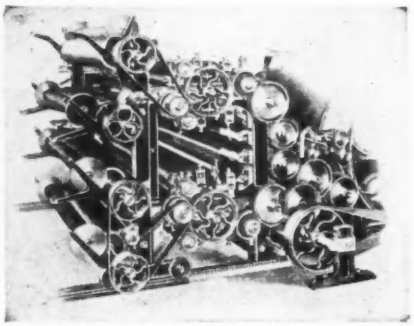

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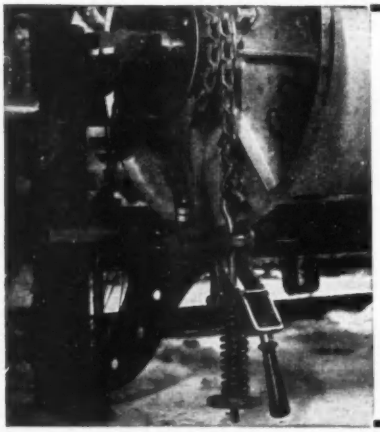

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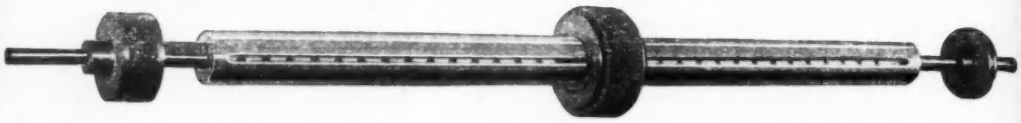

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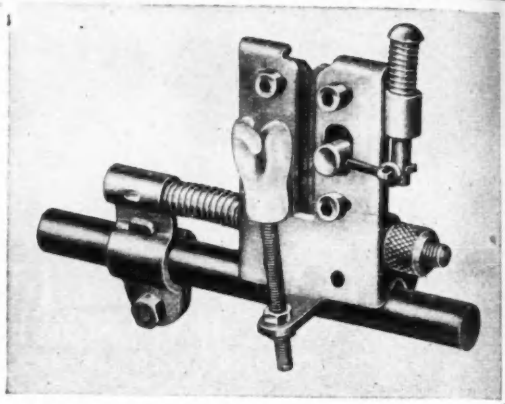

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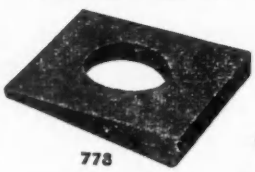

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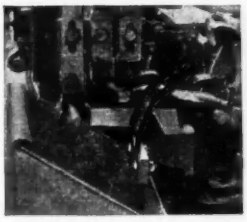

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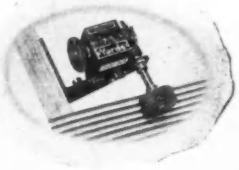

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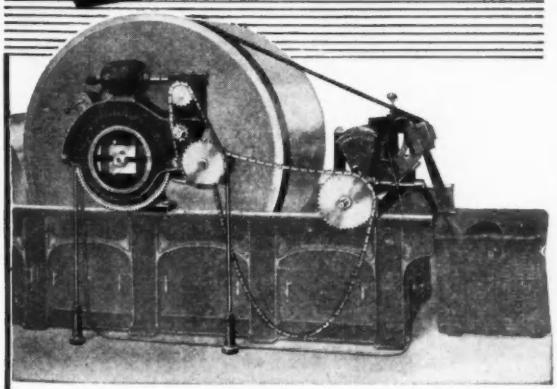

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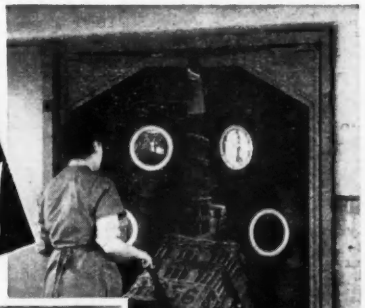

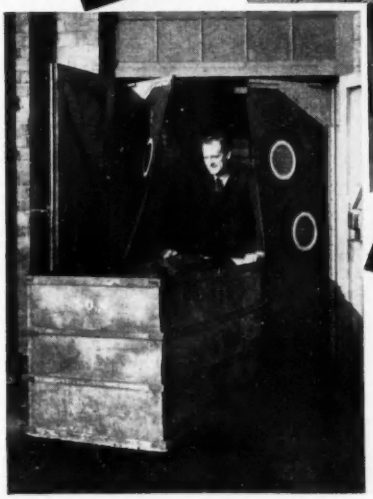

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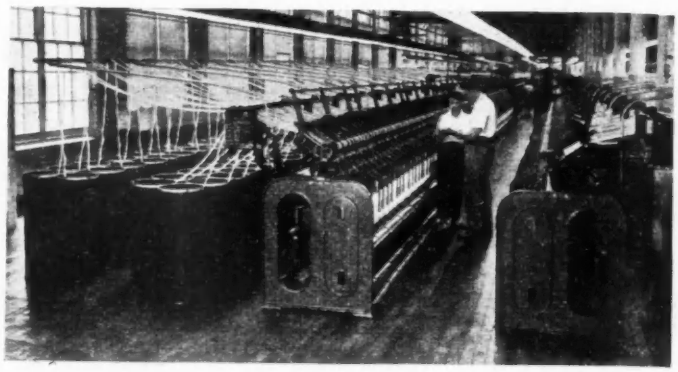

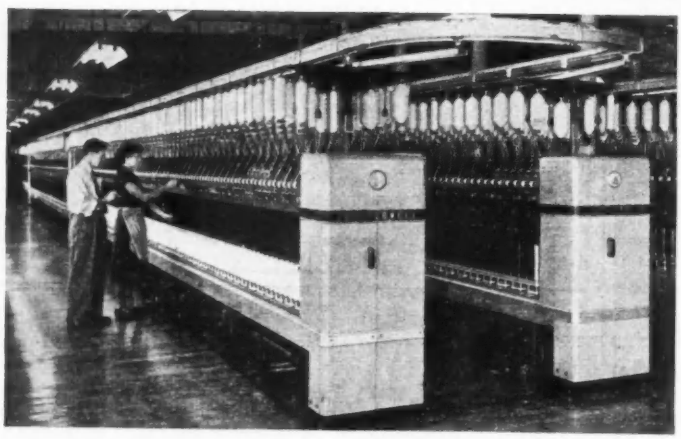

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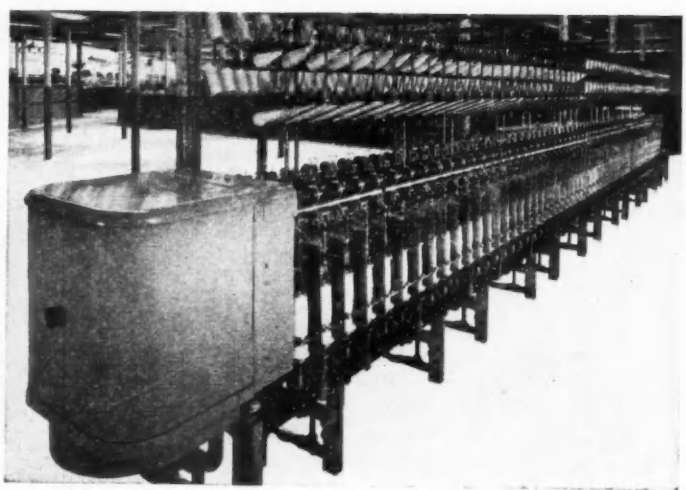

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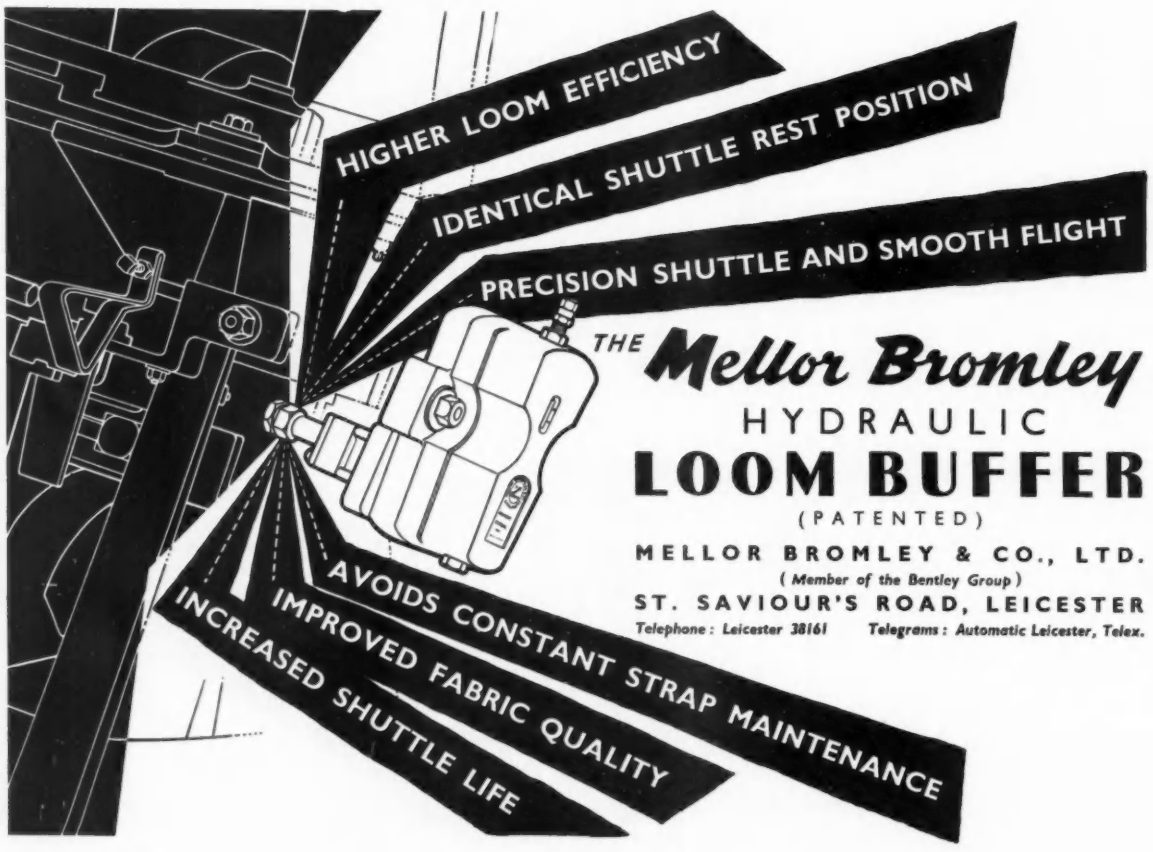

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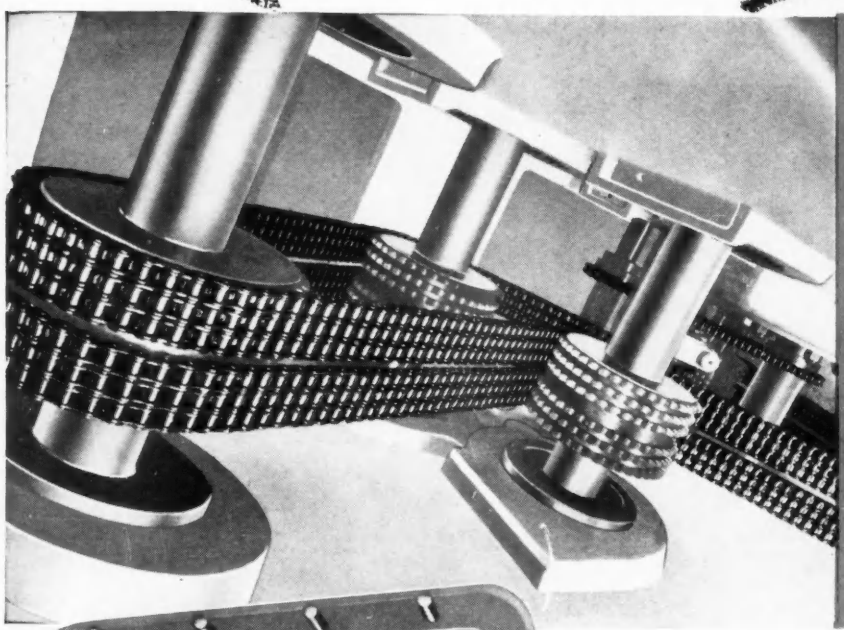

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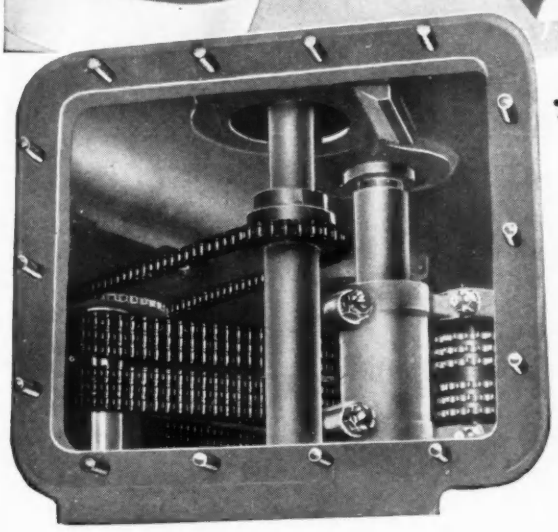

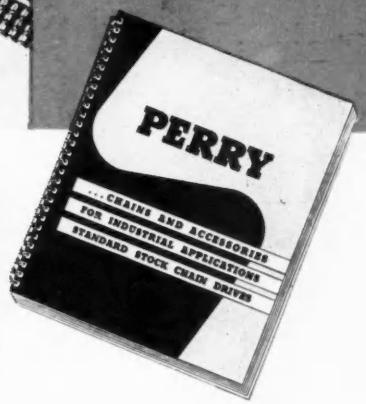

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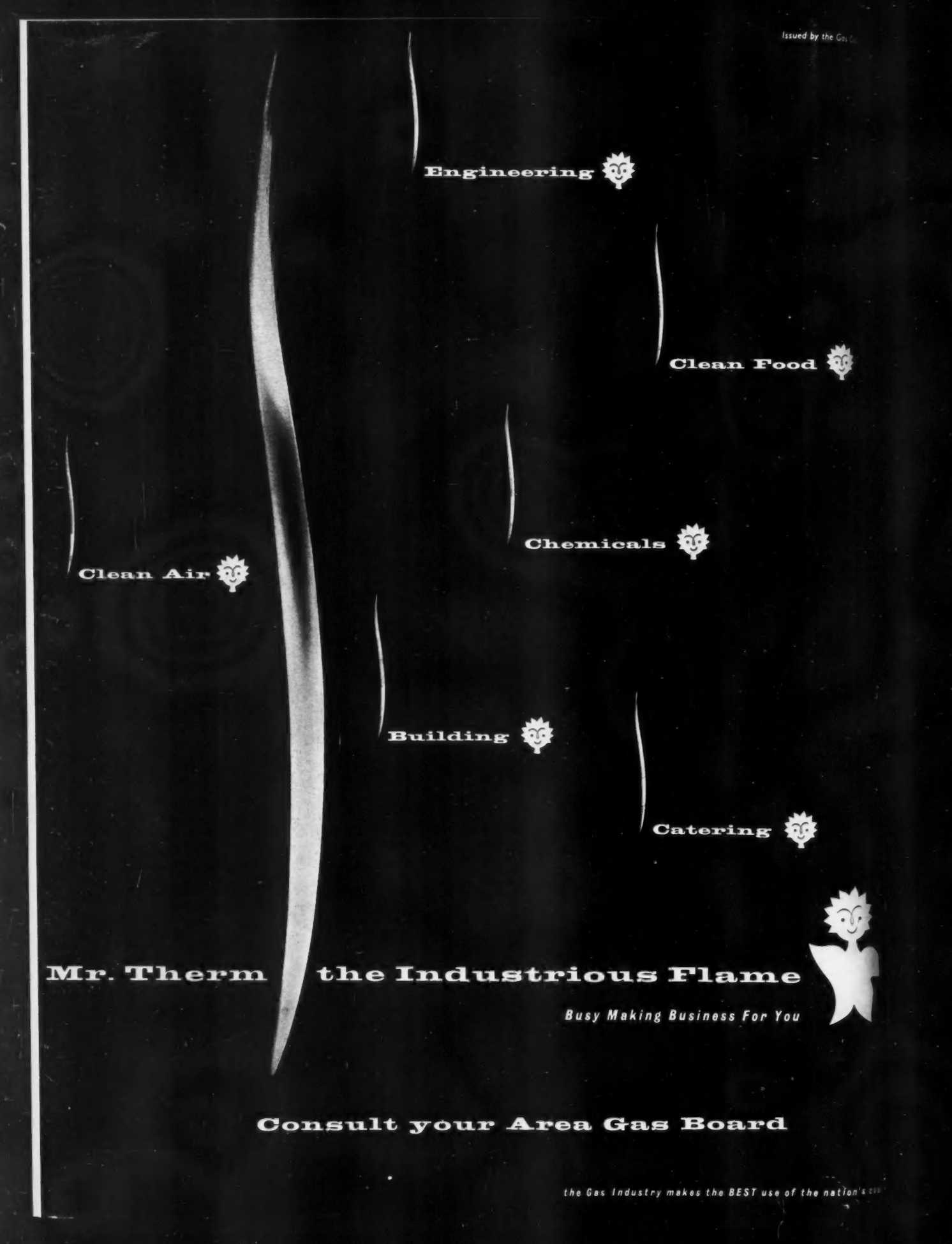
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